**Problem – D (Assembly) DATA**

**Test Instance-37:** TAS1C5D1 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_1)

**Model – 1 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 1;

S = 3;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400],

[25.0625]];

secondary\_demand = [

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[20.0400], // equal to product-1

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[25.0625], // equal to product-2

[25.0625]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 2 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 2;

S = 6;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004],

[25.0625,25.0006]];

secondary\_demand = [

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[20.0400,20.0004], // equal to product-1

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006], // equal to product-2

[25.0625,25.0006]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 3 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 3;

S = 9;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20],

[25.0625,25.0006,25]];

secondary\_demand = [

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[20.0400,20.0004,20], // equal to product-1

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25], // equal to product-2

[25.0625,25.0006,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 4 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 4;

S = 12;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20,20],

[25.0625,25.0006,25,25]];

secondary\_demand = [

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[20.0400,20.0004,20,20], // equal to product-1

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25], // equal to product-2

[25.0625,25.0006,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 5 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 5;

S = 15;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20,20,20],

[25.0625,25.0006,25,25,25]];

secondary\_demand = [

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 6 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 6;

S = 18;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20,20,20,20],

[25.0625,25.0006,25,25,25,25]];

secondary\_demand = [

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 7 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 7;

S = 21;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20,20,20,20,20],

[25.0625,25.0006,25,25,25,25,25]];

secondary\_demand = [

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 8 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 8;

S = 24;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20,20,20,20,20,20],

[25.0625,25.0006,25,25,25,25,25,25]];

secondary\_demand = [

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 9 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 9;

S = 27;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20,20,20,20,20,20,20],

[25.0625,25.0006,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 10 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 10;

S = 30;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20,20,20,20,20,20,20,20],

[25.0625,25.0006,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 11 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 11;

S = 33;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20,20,20,20,20,20,20,20,20],

[25.0625,25.0006,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 12 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 12;

S = 36;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20],

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 13 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 13;

S = 39;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20],

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 14 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 14;

S = 42;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20],

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 15 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 15;

S = 45;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20],

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 16 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 16;

S = 48;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

microperiods16tomacroperiod = {46,47,48};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 1

primary\_demand = [[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20],

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0400,20.0004,20,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.0625,25.0006,25,25,25,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Test Instance-38:** TAS1C5D2 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_2)

**Model – 1 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 1;

S = 3;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000],

[26.5625]];

secondary\_demand = [

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[21.0000], // equal to product-1

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[26.5625], // equal to product-2

[26.5625]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 2 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 2;

S = 6;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100],

[26.5625,25.0156]];

secondary\_demand = [

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[21.0000,20.0100], // equal to product-1

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156], // equal to product-2

[26.5625,25.0156]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 3 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 3;

S = 9;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001],

[26.5625,25.0156,25.0002]];

secondary\_demand = [

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[21.0000,20.0100,20.0001], // equal to product-1

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002], // equal to product-2

[26.5625,25.0156,25.0002]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 4 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 4;

S = 12;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001,20],

[26.5625,25.0156,25.0002,25]];

secondary\_demand = [

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[21.0000,20.0100,20.0001,20], // equal to product-1

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25], // equal to product-2

[26.5625,25.0156,25.0002,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 5 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 5;

S = 15;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001,20,20],

[26.5625,25.0156,25.0002,25,25]];

secondary\_demand = [

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 6 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 6;

S = 18;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001,20,20,20],

[26.5625,25.0156,25.0002,25,25,25]];

secondary\_demand = [

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 7 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 7;

S = 21;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001,20,20,20,20],

[26.5625,25.0156,25.0002,25,25,25,25]];

secondary\_demand = [

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 8 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 8;

S = 24;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001,20,20,20,20,20],

[26.5625,25.0156,25.0002,25,25,25,25,25]];

secondary\_demand = [

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 9 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 9;

S = 27;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001,20,20,20,20,20,20],

[26.5625,25.0156,25.0002,25,25,25,25,25,25]];

secondary\_demand = [

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 10 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 10;

S = 30;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001,20,20,20,20,20,20,20],

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25]];

secondary\_demand = [

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 11 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 11;

S = 33;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20],

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 12 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 12;

S = 36;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20],

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 13 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 13;

S = 39;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20],

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 14 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 14;

S = 42;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20],

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 15 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 15;

S = 45;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20],

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 16 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 16;

S = 48;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

microperiods16tomacroperiod = {46,47,48};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 2

primary\_demand = [[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20],

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[21.0000,20.0100,20.0001,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[26.5625,25.0156,25.0002,25,25,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Test Instance-39:** TAS1C5D3 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_3)

**Model – 1 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 1;

S = 3;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400],

[30.0625]];

secondary\_demand = [

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[23.2400], // equal to product-1

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[30.0625], // equal to product-2

[30.0625]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 2 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 2;

S = 6;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324],

[30.0625,25.0506]];

secondary\_demand = [

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[30.0625,25.0506], // equal to product-2

[26.5625,25.0156], // equal to product-2

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[23.2400,20.0324], // equal to product-1

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506], // equal to product-2

[30.0625,25.0506]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 3 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 3;

S = 9;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003],

[30.0625,25.0506,25.0005]];

secondary\_demand = [

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[23.2400,20.0324,20.0003], // equal to product-1

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005], // equal to product-2

[30.0625,25.0506,25.0005]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 4 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 4;

S = 12;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003,20],

[30.0625,25.0506,25.0005,25]];

secondary\_demand = [

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[23.2400,20.0324,20.0003,20], // equal to product-1

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25], // equal to product-2

[30.0625,25.0506,25.0005,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 5 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 5;

S = 15;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003,20,20],

[30.0625,25.0506,25.0005,25,25]];

secondary\_demand = [

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 6 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 6;

S = 18;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003,20,20,20],

[30.0625,25.0506,25.0005,25,25,25]];

secondary\_demand = [

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 7 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 7;

S = 21;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003,20,20,20,20],

[30.0625,25.0506,25.0005,25,25,25,25]];

secondary\_demand = [

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 8 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 8;

S = 24;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003,20,20,20,20,20],

[30.0625,25.0506,25.0005,25,25,25,25,25]];

secondary\_demand = [

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 9 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 9;

S = 27;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003,20,20,20,20,20,20],

[30.0625,25.0506,25.0005,25,25,25,25,25,25]];

secondary\_demand = [

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 10 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 10;

S = 30;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003,20,20,20,20,20,20,20],

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25]];

secondary\_demand = [

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 11 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 11;

S = 33;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20],

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 12 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 12;

S = 36;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20],

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 13 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 13;

S = 39;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20],

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 14 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 14;

S = 42;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20],

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 15 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 15;

S = 45;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20],

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 16 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 16;

S = 48;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

microperiods16tomacroperiod = {46,47,48};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 3

primary\_demand = [[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20],

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[23.2400,20.0324,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[30.0625,25.0506,25.0005,25,25,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

//

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Test Instance-40:** TAS1C5D4 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_4)

**Model – 1 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 1;

S = 3;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900],

[25.1406]];

secondary\_demand = [

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[20.0900], // equal to product-1

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[25.1406], // equal to product-2

[25.1406]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 2 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 2;

S = 6;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020],

[25.1406,25.0032]];

secondary\_demand = [

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[20.0900,20.0020], // equal to product-1

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032], // equal to product-2

[25.1406,25.0032]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 3 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 3;

S = 9;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000],

[25.1406,25.0032,25.0001]];

secondary\_demand = [

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[20.0900,20.0020,20.0000], // equal to product-1

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001], // equal to product-2

[25.1406,25.0032,25.0001]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 4 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 4;

S = 12;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000,20],

[25.1406,25.0032,25.0001,25]];

secondary\_demand = [

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[20.0900,20.0020,20.0000,20], // equal to product-1

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25], // equal to product-2

[25.1406,25.0032,25.0001,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 5 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 5;

S = 15;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000,20,20],

[25.1406,25.0032,25.0001,25,25]];

secondary\_demand = [

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 6 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 6;

S = 18;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000,20,20,20],

[25.1406,25.0032,25.0001,25,25]];

secondary\_demand = [

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 7 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 7;

S = 21;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000,20,20,20,20],

[25.1406,25.0032,25.0001,25,25,25,25]];

secondary\_demand = [

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 8 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 8;

S = 24;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000,20,20,20,20,20],

[25.1406,25.0032,25.0001,25,25,25,25,25]];

secondary\_demand = [

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 9 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 9;

S = 27;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000,20,20,20,20,20,20],

[25.1406,25.0032,25.0001,25,25,25,25,25,25]];

secondary\_demand = [

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 10 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 10;

S = 30;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000,20,20,20,20,20,20,20],

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 11 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 11;

S = 33;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20],

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 12 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 12;

S = 36;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20],

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 13 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 13;

S = 39;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20],

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 14 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 14;

S = 42;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20],

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 15 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 15;

S = 45;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20],

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 16 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 16;

S = 48;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

microperiods16tomacroperiod = {46,47,48};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand - Series# 4

primary\_demand = [[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20],

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.0900,20.0020,20.0000,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.1406,25.0032,25.0001,25,25,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Test Instance-41:** TAS1C5D5 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_5)

**Model – 1 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 1;

S = 3;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500],

[28.5156]];

secondary\_demand = [

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[22.2500], // equal to product-1

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[28.5156], // equal to product-2

[28.5156]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 2 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 2;

S = 6;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506],

[28.5156,25.0791]];

secondary\_demand = [

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[22.2500,20.0506], // equal to product-1

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791], // equal to product-2

[28.5156,25.0791]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 3 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 3;

S = 9;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011],

[28.5156,25.0791,25.0018]];

secondary\_demand = [

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[22.2500,20.0506,20.0011], // equal to product-1

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018], // equal to product-2

[28.5156,25.0791,25.0018]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 4 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 4;

S = 12;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011,20],

[28.5156,25.0791,25.0018,25]];

secondary\_demand = [

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[22.2500,20.0506,20.0011,20], // equal to product-1

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25], // equal to product-2

[28.5156,25.0791,25.0018,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 5 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 5;

S = 15;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011,20,20],

[28.5156,25.0791,25.0018,25,25]];

secondary\_demand = [

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 6 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 6;

S = 18;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011,20,20,20],

[28.5156,25.0791,25.0018,25,25,25]];

secondary\_demand = [

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 7 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 7;

S = 21;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011,20,20,20,20],

[28.5156,25.0791,25.0018,25,25,25,25]];

secondary\_demand = [

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 8 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 8;

S = 24;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011,20,20,20,20,20],

[28.5156,25.0791,25.0018,25,25,25,25,25]];

secondary\_demand = [

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 9 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 9;

S = 27;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011,20,20,20,20,20,20],

[28.5156,25.0791,25.0018,25,25,25,25,25,25]];

secondary\_demand = [

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 10 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 10;

S = 30;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011,20,20,20,20,20,20,20],

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25]];

secondary\_demand = [

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 11 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 11;

S = 33;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20],

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 12 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 12;

S = 36;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20],

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 13 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 13;

S = 39;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20],

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 14 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 14;

S = 42;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20],

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 15 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 15;

S = 45;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20],

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 16 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 16;

S = 48;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

microperiods16tomacroperiod = {46,47,48};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 5

primary\_demand = [[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20],

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[22.2500,20.0506,20.0011,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[28.5156,25.0791,25.0018,25,25,25,25,25,25,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Test Instance-42:** TAS1C5D6 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_6)

**Model – 1 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 1;

S = 3;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900],

[36.3906]];

secondary\_demand = [

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[27.2900], // equal to product-1

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[36.3906], // equal to product-2

[36.3906]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 2 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 2;

S = 6;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640],

[36.3906,25.2563]];

secondary\_demand = [

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[27.2900,20.1640], // equal to product-1

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563], // equal to product-2

[36.3906,25.2563]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 3 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 3;

S = 9;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037],

[36.3906,25.2563,25.0058]];

secondary\_demand = [

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[27.2900,20.1640,20.0037], // equal to product-1

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058], // equal to product-2

[36.3906,25.2563,25.0058]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 4 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 4;

S = 12;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037,20.0001],

[36.3906,25.2563,25.0058,25.0001]];

secondary\_demand = [

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[27.2900,20.1640,20.0037,20.0001], // equal to product-1

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001], // equal to product-2

[36.3906,25.2563,25.0058,25.0001]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 5 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 5;

S = 15;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037,20.0001,20],

[36.3906,25.2563,25.0058,25.0001,25]];

secondary\_demand = [

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 6 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 6;

S = 18;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037,20.0001,20,20],

[36.3906,25.2563,25.0058,25.0001,25,25]];

secondary\_demand = [

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 7 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 7;

S = 21;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037,20.0001,20,20,20],

[36.3906,25.2563,25.0058,25.0001,25,25,25]];

secondary\_demand = [

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 8 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 8;

S = 24;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037,20.0001,20,20,20,20],

[36.3906,25.2563,25.0058,25.0001,25,25,25,25]];

secondary\_demand = [

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 9 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 9;

S = 27;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20],

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25]];

secondary\_demand = [

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 10 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 10;

S = 30;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20],

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25]];

secondary\_demand = [

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 11 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 11;

S = 33;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20],

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25]];

secondary\_demand = [

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 12 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 12;

S = 36;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20],

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 13 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 13;

S = 39;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20],

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 14 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 14;

S = 42;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20],

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 15 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 15;

S = 45;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20],

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 16 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 16;

S = 48;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

microperiods16tomacroperiod = {46,47,48};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 6

primary\_demand = [[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20],

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[27.2900,20.1640,20.0037,20.0001,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[36.3906,25.2563,25.0058,25.0001,25,25,25,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Test Instance-43:** TAS1C5D7 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_7)

**Model – 1 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 1;

S = 3;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600],

[25.2500]];

secondary\_demand = [

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[20.1600], // equal to product-1

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[25.2500], // equal to product-2

[25.2500]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 2 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 2;

S = 6;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064],

[25.2500,25.0100]];

secondary\_demand = [

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[20.1600,20.0064], // equal to product-1

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100], // equal to product-2

[25.2500,25.0100]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 3 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 3;

S = 9;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003],

[25.2500,25.0100,25.0004]];

secondary\_demand = [

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[20.1600,20.0064,20.0003], // equal to product-1

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004], // equal to product-2

[25.2500,25.0100,25.0004]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 4 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 4;

S = 12;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003,20],

[25.2500,25.0100,25.0004,25]];

secondary\_demand = [

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[20.1600,20.0064,20.0003,20], // equal to product-1

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25], // equal to product-2

[25.2500,25.0100,25.0004,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 5 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 5;

S = 15;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003,20,20],

[25.2500,25.0100,25.0004,25,25]];

secondary\_demand = [

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 6 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 6;

S = 18;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003,20,20,20],

[25.2500,25.0100,25.0004,25,25,25]];

secondary\_demand = [

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 7 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 7;

S = 21;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003,20,20,20,20],

[25.2500,25.0100,25.0004,25,25,25,25]];

secondary\_demand = [

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 8 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 8;

S = 24;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003,20,20,20,20,20],

[25.2500,25.0100,25.0004,25,25,25,25,25]];

secondary\_demand = [

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 9 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 9;

S = 27;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003,20,20,20,20,20,20],

[25.2500,25.0100,25.0004,25,25,25,25,25,25]];

secondary\_demand = [

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 10 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 10;

S = 30;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003,20,20,20,20,20,20,20],

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25]]; // equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 11 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 11;

S = 33;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20],

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 12 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 12;

S = 36;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20],

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 13 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 13;

S = 39;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20],

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 14 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 14;

S = 42;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20],

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 15 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 15;

S = 45;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20],

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 16 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 16;

S = 48;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

microperiods16tomacroperiod = {46,47,48};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 7

primary\_demand = [[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20],

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Test Instance-44:** TAS1C5D8 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_8)

**Model – 1 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 1;

S = 3;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000],

[31.2500]];

secondary\_demand = [

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[24.0000], // equal to product-1

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[31.2500], // equal to product-2

[31.2500]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 2 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 2;

S = 6;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600],

[31.2500,25.2500]];

secondary\_demand = [

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[24.0000,20.1600], // equal to product-1

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500], // equal to product-2

[31.2500,25.2500]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 3 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 3;

S = 9;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064],

[31.2500,25.2500,25.0100]];

secondary\_demand = [

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[24.0000,20.1600,20.0064], // equal to product-1

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100], // equal to product-2

[31.2500,25.2500,25.0100]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 4 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 4;

S = 12;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064,20.0003],

[31.2500,25.2500,25.0100,25.0004]];

secondary\_demand = [

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[24.0000,20.1600,20.0064,20.0003], // equal to product-1

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004], // equal to product-2

[31.2500,25.2500,25.0100,25.0004]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 5 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 5;

S = 15;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064,20.0003,20],

[31.2500,25.2500,25.0100,25.0004,25]];

secondary\_demand = [

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 6 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 6;

S = 18;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064,20.0003,20,20],

[31.2500,25.2500,25.0100,25.0004,25,25]];

secondary\_demand = [

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 7 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 7;

S = 21;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064,20.0003,20,20,20],

[31.2500,25.2500,25.0100,25.0004,25,25,25]];

secondary\_demand = [

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 8 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 8;

S = 24;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064,20.0003,20,20,20,20],

[31.2500,25.2500,25.0100,25.0004,25,25,25,25]];

secondary\_demand = [

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 9 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 9;

S = 27;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20],

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25]];

secondary\_demand = [

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 10 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 10;

S = 30;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20],

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25]];

secondary\_demand = [

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 11 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 11;

S = 33;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20],

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25]];

secondary\_demand = [

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 12 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 12;

S = 36;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20],

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 13 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 13;

S = 39;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20],

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 14 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 14;

S = 42;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20],

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 15 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 15;

S = 45;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20],

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 16 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 16;

S = 48;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

microperiods16tomacroperiod = {46,47,48};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 8

primary\_demand = [[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20],

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[24.0000,20.1600,20.0064,20.0003,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[31.2500,25.2500,25.0100,25.0004,25,25,25,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Test Instance-45:** TAS1C5D9 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_9)

**Model – 1 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 1;

S = 3;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600],

[45.2500]];

secondary\_demand = [

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[32.9600], // equal to product-1

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[45.2500], // equal to product-2

[45.2500]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 2 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 2;

S = 6;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184],

[45.2500,25.8100]];

secondary\_demand = [

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[32.9600,20.5184], // equal to product-1

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100], // equal to product-2

[45.2500,25.8100]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 3 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 3;

S = 9;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207],

[45.2500,25.8100,25.0324]];

secondary\_demand = [

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[32.9600,20.5184,20.0207], // equal to product-1

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324], // equal to product-2

[45.2500,25.8100,25.0324]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 4 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 4;

S = 12;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207,20.0008],

[45.2500,25.8100,25.0324,25.0013]];

secondary\_demand = [

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[32.9600,20.5184,20.0207,20.0008], // equal to product-1

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013], // equal to product-2

[45.2500,25.8100,25.0324,25.0013]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 5 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 5;

S = 15;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207,20.0008,20],

[45.2500,25.8100,25.0324,25.0013,25.0001]];

secondary\_demand = [

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 6 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 6;

S = 18;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207,20.0008,20,20],

[45.2500,25.8100,25.0324,25.0013,25.0001,25]];

secondary\_demand = [

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 7 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 7;

S = 21;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207,20.0008,20,20,20],

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25]];

secondary\_demand = [

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 8 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 8;

S = 24;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207,20.0008,20,20,20,20],

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25]];

secondary\_demand = [

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 9 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 9;

S = 27;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20],

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25]];

secondary\_demand = [

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 10 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 10;

S = 30;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20],

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25]];

secondary\_demand = [

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 11 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 11;

S = 33;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20],

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25]];

secondary\_demand = [

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 12 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 12;

S = 36;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20],

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25]];

secondary\_demand = [

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 13 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 13;

S = 39;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20],

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 14 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 14;

S = 42;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20],

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 15 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 15;

S = 45;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20],

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];

**Model – 16 Data:**

FP = 2;

RP = 40;

J = 40;

L = 6;

T = 16;

S = 48;

allproductsonstage1 = {31,32,33,34,35,36,37,38,39,40};

allproductsonstage2\_1 = {15,16,17,18,19,20,21,22};

allproductsonstage2\_2 = {23,24,25,26,27,28,29,30};

allproductsonstage3 = {7,8,9,10,11,12,13,14};

allproductsonstage4 = {3,4,5,6};

allproductsonstage5 = {1,2};

family1stage1 = {31,32};

family2stage1 = {33,34};

family3stage1 = {35,36};

family4stage1 = {37,38};

family5stage1 = {39,40};

family1stage2\_1 = {20};

family2stage2\_1 = {22};

family3stage2\_1 = {15,16};

family4stage2\_1 = {17,18};

family5stage2\_1 = {19,20};

family6stage2\_1 = {21,22};

family1stage2\_2 = {23};

family2stage2\_2 = {27};

family3stage2\_2 = {29};

family4stage2\_2 = {23,24};

family5stage2\_2 = {25,26};

family6stage2\_2 = {27,28};

family7stage2\_2 = {29,30};

family1stage3 = {7};

family2stage3 = {8};

family3stage3 = {9};

family4stage3 = {10};

family5stage3 = {11};

family6stage3 = {12};

family7stage3 = {13};

family8stage3 = {14};

family9stage3 = {7,8};

family10stage3 = {9,10};

family11stage3 = {11,12};

family12stage3 = {13,14};

family1stage4 = {3};

family2stage4 = {4};

family3stage4 = {5};

family4stage4 = {6};

family5stage4 = {3,4};

family6stage4 = {5,6};

family1stage5 = {1};

family2stage5 = {2};

microperiods1tomacroperiod = {1,2,3};

microperiods2tomacroperiod = {4,5,6};

microperiods3tomacroperiod = {7,8,9};

microperiods4tomacroperiod = {10,11,12};

microperiods5tomacroperiod = {13,14,15};

microperiods6tomacroperiod = {16,17,18};

microperiods7tomacroperiod = {19,20,21};

microperiods8tomacroperiod = {22,23,24};

microperiods9tomacroperiod = {25,26,27};

microperiods10tomacroperiod = {28,29,30};

microperiods11tomacroperiod = {31,32,33};

microperiods12tomacroperiod = {34,35,36};

microperiods13tomacroperiod = {37,38,39};

microperiods14tomacroperiod = {40,41,42};

microperiods15tomacroperiod = {43,44,45};

microperiods16tomacroperiod = {46,47,48};

min\_lotsize = 1;

production\_cost = 1;

production\_time = 1;

standby\_cost = 1;

BOM = 1;

BigM = 10000;

holdingcost = [19,21,7,11,9,11,3,3,5,5,5,3,5,5,1,1,1,1,1,3,1,3,3,1,1,1,3,1,3,1,1,1,1,1,1,1,1,1,1,1];

//Product Demand – Series # 9

primary\_demand = [[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20],

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25]];

secondary\_demand = [

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[32.9600,20.5184,20.0207,20.0008,20,20,20,20,20,20,20,20,20,20,20,20], // equal to product-1

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25], // equal to product-2

[45.2500,25.8100,25.0324,25.0013,25.0001,25,25,25,25,25,25,25,25,25,25,25]];// equal to product-2

// Setup Profile - I

setuptime = [25,25,25,25,25,25,25,25,25,25,20,20,20,20,20,20,20,20,20,20,15,15,15,15,15,15,15,15,15,15,10,10,10,10,10,10,10,10,10,10];

setupcost = [10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)

productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];