Problem – D (Assembly) → DATA

Test Instance-1: TAS1C1D1 (Test Assembly Setup-Profile_1 Capacity-Profile_1 Demand-Series_1)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [100.0000,200.0000,378.9474,326.3158,336.8421,347.3684];
```

Test Instance-2: TAS1C1D2 (Test Assembly Setup-Profile_1 Capacity-Profile_1 Demand-Series_2)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
//
// Capacity Utilization Profile - I (90%)
productstagecapacity = [100.0000,200.0000,378.9474,326.3158,336.8421,347.3684];
```

Test Instance-3: TAS1C1D3 (Test Assembly Setup-Profile_1 Capacity-Profile_1 Demand-Series_3)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
//
// Capacity Utilization Profile - I (90%)
productstagecapacity = [100.0000,200.0000,378.9474,326.3158,336.8421,347.3684];
```

Test Instance-4: TAS1C1D4 (Test Assembly Setup-Profile_1 Capacity-Profile_1 Demand-Series_4)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [100.0000,200.0000,378.9474,326.3158,336.8421,347.3684];
```

Test Instance-5: TAS1C1D5 (Test Assembly Setup-Profile_1 Capacity-Profile_1 Demand-Series_5)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
//
// Capacity Utilization Profile - I (90%)
productstagecapacity = [100.0000,200.0000,378.9474,326.3158,336.8421,347.3684];
```

Test Instance-6: TAS1C1D6 (Test Assembly Setup-Profile_1 Capacity-Profile_1 Demand-Series_6)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [100.0000,200.0000,378.9474,326.3158,336.8421,347.3684];
```

Test Instance-7: TAS1C1D7 (Test Assembly Setup-Profile_1 Capacity-Profile_1 Demand-Series_7)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
//
// Capacity Utilization Profile - I (90%)
productstagecapacity = [100.0000,200.0000,378.9474,326.3158,336.8421,347.3684];
```

Test Instance-8: TAS1C1D8 (Test Assembly Setup-Profile_1 Capacity-Profile_1 Demand-Series_8)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [100.0000,200.0000,378.9474,326.3158,336.8421,347.3684];
```

Test Instance-9: TAS1C1D9 (Test Assembly Setup-Profile_1 Capacity-Profile_1 Demand-Series_9)

```
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];

//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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
// Capacity Utilization Profile - I (90%)
productstagecapacity = [100.0000,200.0000,378.9474,326.3158,336.8421,347.3684];
```

Test Instance-10: TAS1C2D1 (Test Assembly Setup-Profile_1 Capacity-Profile_2 Demand-Series_1)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [126.6667,253.3333,480.0000,413.3333,426.6667,440.0000];
```

Test Instance-11: TAS1C2D2 (Test Assembly Setup-Profile_1 Capacity-Profile_2 Demand-Series_2)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [126.6667,253.3333,480.0000,413.3333,426.6667,440.0000];
```

Test Instance-12: TAS1C2D3 (Test Assembly Setup-Profile_1 Capacity-Profile_2 Demand-Series_3)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [126.6667,253.3333,480.0000,413.3333,426.6667,440.0000];
```

Test Instance-13: TAS1C2D4 (Test Assembly Setup-Profile_1 Capacity-Profile_2 Demand-Series_4)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [126.6667,253.3333,480.0000,413.3333,426.6667,440.0000];
```

Test Instance-14: TAS1C2D5 (Test Assembly Setup-Profile_1 Capacity-Profile_2 Demand-Series_5)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [126.6667,253.3333,480.0000,413.3333,426.6667,440.0000];
```

Test Instance-15: TAS1C2D6 (Test Assembly Setup-Profile_1 Capacity-Profile_2 Demand-Series_6)

```
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 = 
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [126.6667,253.3333,480.0000,413.3333,426.6667,440.0000];
```

Test Instance-16: TAS1C2D7 (Test Assembly Setup-Profile_1 Capacity-Profile_2 Demand-Series_7)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [126.6667,253.3333,480.0000,413.3333,426.6667,440.0000];
```

Test Instance-17: TAS1C2D8 (Test Assembly Setup-Profile_1 Capacity-Profile_2 Demand-Series_8)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [126.6667,253.3333,480.0000,413.3333,426.6667,440.0000];
```

Test Instance-18: TAS1C2D9 (Test Assembly Setup-Profile_1 Capacity-Profile_2 Demand-Series_9)

```
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];

//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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
// Capacity Utilization Profile - II (70%)
productstagecapacity = [126.6667,253.3333,480.0000,413.3333,426.6667,440.0000];
```

Test Instance-19: TAS1C3D1 (Test Assembly Setup-Profile_1 Capacity-Profile_3 Demand-Series_1)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [172.7273,345.4545,654.5454,563.6364,581.8182,600.0000];
```

Test Instance-20: TAS1C3D2 (Test Assembly Setup-Profile_1 Capacity-Profile_3 Demand-Series_2)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [172.7273,345.4545,654.5454,563.6364,581.8182,600.0000];
```

Test Instance-21: TAS1C3D3 (Test Assembly Setup-Profile_1 Capacity-Profile_3 Demand-Series_3)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [172.7273,345.4545,654.5454,563.6364,581.8182,600.0000];
```

Test Instance-22: TAS1C3D4 (Test Assembly Setup-Profile_1 Capacity-Profile_3 Demand-Series_4)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [172.7273,345.4545,654.5454,563.6364,581.8182,600.0000];
```

Test Instance-23: TAS1C3D5 (Test Assembly Setup-Profile_1 Capacity-Profile_3 Demand-Series_5)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [172.7273,345.4545,654.5454,563.6364,581.8182,600.0000];
```

Test Instance-24: TAS1C3D6 (Test Assembly Setup-Profile_1 Capacity-Profile_3 Demand-Series_6)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [172.7273,345.4545,654.5454,563.6364,581.8182,600.0000];
```

Test Instance-25: TAS1C3D7 (Test Assembly Setup-Profile_1 Capacity-Profile_3 Demand-Series_7)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [172.7273,345.4545,654.5454,563.6364,581.8182,600.0000];
```

Test Instance-26: TAS1C3D8 (Test Assembly Setup-Profile_1 Capacity-Profile_3 Demand-Series_8)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [172.7273,345.4545,654.5454,563.6364,581.8182,600.0000];
```

Test Instance-27: TAS1C3D9 (Test Assembly Setup-Profile_1 Capacity-Profile_3 Demand-Series_9)

```
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];

//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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
// Capacity Utilization Profile - III (50%)
productstagecapacity = [172.7273,345.4545,654.5454,563.6364,581.8182,600.0000];
```

Test Instance-28: TAS1C4D1 (Test Assembly Setup-Profile_1 Capacity-Profile_4 Demand-Series_1)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [100.0000,200.0000,480.0000,413.3333,581.8182,600.0000];
```

Test Instance-29: TAS1C4D2 (Test Assembly Setup-Profile_1 Capacity-Profile_4 Demand-Series_2)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [100.0000,200.0000,480.0000,413.3333,581.8182,600.0000];
```

Test Instance-30: TAS1C4D3 (Test Assembly Setup-Profile_1 Capacity-Profile_4 Demand-Series_3)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [100.0000,200.0000,480.0000,413.3333,581.8182,600.0000];
```

Test Instance-31: TAS1C4D4 (Test Assembly Setup-Profile_1 Capacity-Profile_4 Demand-Series_4)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [100.0000,200.0000,480.0000,413.3333,581.8182,600.0000];
```

Test Instance-32: TAS1C4D5 (Test Assembly Setup-Profile_1 Capacity-Profile_4 Demand-Series_5)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [100.0000,200.0000,480.0000,413.3333,581.8182,600.0000];
```

Test Instance-33: TAS1C4D6 (Test Assembly Setup-Profile_1 Capacity-Profile_4 Demand-Series_6)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [100.0000,200.0000,480.0000,413.3333,581.8182,600.0000];
```

Test Instance-34: TAS1C4D7 (Test Assembly Setup-Profile_1 Capacity-Profile_4 Demand-Series_7)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [100.0000,200.0000,480.0000,413.3333,581.8182,600.0000];
```

Test Instance-35: TAS1C4D8 (Test Assembly Setup-Profile_1 Capacity-Profile_4 Demand-Series_8)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [100.0000,200.0000,480.0000,413.3333,581.8182,600.0000];
```

Test Instance-36: TAS1C4D9 (Test Assembly Setup-Profile_1 Capacity-Profile_4 Demand-Series_9)

```
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];

//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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [100.0000,200.0000,480.0000,413.3333,581.8182,600.0000];
```

Test Instance-37: TAS1C5D1 (Test Assembly Setup-Profile_1 Capacity-Profile_5 Demand-Series_1)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// 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)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// 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)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// 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)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// 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)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// 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)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// 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)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// 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)

```
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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// 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)

```
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];

//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 =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [172.7273,345.4545,480.0000,413.3333,336.8421,347.3684];
```

SETUP PROFILE – II

Test Instance-1: TAS2C1D1 (Test Assembly Setup-Profile_2 Capacity-Profile_1 Demand-Series_1)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [68.4211,136.8421,294.7368,305.2632,378.9474,505.2632];
```

Test Instance-2: TAS2C1D2 (Test Assembly Setup-Profile_2 Capacity-Profile_1 Demand-Series_2)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [68.4211,136.8421,294.7368,305.2632,378.9474,505.2632];
```

Test Instance-3: TAS2C1D3 (Test Assembly Setup-Profile_2 Capacity-Profile_1 Demand-Series_3)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [68.4211,136.8421,294.7368,305.2632,378.9474,505.2632];
```

Test Instance-4: TAS2C1D4 (Test Assembly Setup-Profile_2 Capacity-Profile_1 Demand-Series_4)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [68.4211,136.8421,294.7368,305.2632,378.9474,505.2632];
```

Test Instance-5: TAS2C1D5 (Test Assembly Setup-Profile_2 Capacity-Profile_1 Demand-Series_5)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [68.4211,136.8421,294.7368,305.2632,378.9474,505.2632];
```

Test Instance-6: TAS2C1D6 (Test Assembly Setup-Profile_2 Capacity-Profile_1 Demand-Series_6)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [68.4211,136.8421,294.7368,305.2632,378.9474,505.2632];
```

Test Instance-7: TAS2C1D7 (Test Assembly Setup-Profile_2 Capacity-Profile_1 Demand-Series_7)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [68.4211,136.8421,294.7368,305.2632,378.9474,505.2632];
```

Test Instance-8: TAS2C1D8 (Test Assembly Setup-Profile_2 Capacity-Profile_1 Demand-Series_8)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [68.4211,136.8421,294.7368,305.2632,378.9474,505.2632];
```

Test Instance-9: TAS2C1D9 (Test Assembly Setup-Profile_2 Capacity-Profile_1 Demand-Series_9)

```
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];

//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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
// Capacity Utilization Profile - I (90%)
productstagecapacity = [68.4211,136.8421,294.7368,305.2632,378.9474,505.2632];
```

Test Instance-10: TAS2C2D1 (Test Assembly Setup-Profile_2 Capacity-Profile_2 Demand-Series_1)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [86.6667,173.3333,373.3333,386.6667,480.0000,640.0000];
```

Test Instance-11: TAS2C2D2 (Test Assembly Setup-Profile_2 Capacity-Profile_2 Demand-Series_2)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [86.6667,173.3333,373.3333,386.6667,480.0000,640.0000];
```

Test Instance-12: TAS2C2D3 (Test Assembly Setup-Profile_2 Capacity-Profile_2 Demand-Series_3)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [86.6667,173.3333,373.3333,386.6667,480.0000,640.0000];
```

Test Instance-13: TAS2C2D4 (Test Assembly Setup-Profile_2 Capacity-Profile_2 Demand-Series_4)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [86.6667,173.3333,373.3333,386.6667,480.0000,640.0000];
```

Test Instance-14: TAS2C2D5 (Test Assembly Setup-Profile_2 Capacity-Profile_2 Demand-Series_5)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [86.6667,173.3333,373.3333,386.6667,480.0000,640.0000];
```

Test Instance-15: TAS2C2D6 (Test Assembly Setup-Profile_2 Capacity-Profile_2 Demand-Series_6)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [86.6667,173.3333,373.3333,386.6667,480.0000,640.0000];
```

Test Instance-16: TAS2C2D7 (Test Assembly Setup-Profile_2 Capacity-Profile_2 Demand-Series_7)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [86.6667,173.3333,373.3333,386.6667,480.0000,640.0000];
```

Test Instance-17: TAS2C2D8 (Test Assembly Setup-Profile_2 Capacity-Profile_2 Demand-Series_8)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [86.6667,173.3333,373.3333,386.6667,480.0000,640.0000];
```

Test Instance-18: TAS2C2D9 (Test Assembly Setup-Profile_2 Capacity-Profile_2 Demand-Series_9)

```
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];

//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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
// Capacity Utilization Profile - II (70%)
productstagecapacity = [86.6667,173.3333,373.3333,386.6667,480.0000,640.0000];
```

Test Instance-19: TAS2C3D1 (Test Assembly Setup-Profile_2 Capacity-Profile_3 Demand-Series_1)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
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 - III (50%)
productstagecapacity = [118.1818,236.3636,509.0909,527.2727,654.5454,872.7272];
```

Test Instance-20: TAS2C3D2 (Test Assembly Setup-Profile_2 Capacity-Profile_3 Demand-Series_2)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [118.1818,236.3636,509.0909,527.2727,654.5454,872.7272];
```

Test Instance-21: TAS2C3D3 (Test Assembly Setup-Profile_2 Capacity-Profile_3 Demand-Series_3)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [118.1818,236.3636,509.0909,527.2727,654.5454,872.7272];
```

Test Instance-22: TAS2C3D4 (Test Assembly Setup-Profile_2 Capacity-Profile_3 Demand-Series_4)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [118.1818,236.3636,509.0909,527.2727,654.5454,872.7272];
```

Test Instance-23: TAS2C3D5 (Test Assembly Setup-Profile_2 Capacity-Profile_3 Demand-Series_5)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [118.1818,236.3636,509.0909,527.2727,654.5454,872.7272];
```

Test Instance-24: TAS2C3D6 (Test Assembly Setup-Profile_2 Capacity-Profile_3 Demand-Series_6)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [118.1818,236.3636,509.0909,527.2727,654.5454,872.7272];
```

Test Instance-25: TAS2C3D7 (Test Assembly Setup-Profile_2 Capacity-Profile_3 Demand-Series_7)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [118.1818,236.3636,509.0909,527.2727,654.5454,872.7272];
```

Test Instance-26: TAS2C3D8 (Test Assembly Setup-Profile_2 Capacity-Profile_3 Demand-Series_8)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [118.1818,236.3636,509.0909,527.2727,654.5454,872.7272];
```

Test Instance-27: TAS2C3D9 (Test Assembly Setup-Profile_2 Capacity-Profile_3 Demand-Series_9)

```
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];

//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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
// Capacity Utilization Profile - III (50%)
productstagecapacity = [118.1818,236.3636,509.0909,527.2727,654.5454,872.7272];
```

Test Instance-28: TAS2C4D1 (Test Assembly Setup-Profile_2 Capacity-Profile_4 Demand-Series_1)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [68.4211,136.8421,373.3333,386.6667,654.5454,872.7272];
```

Test Instance-29: TAS2C4D2 (Test Assembly Setup-Profile_2 Capacity-Profile_4 Demand-Series_2)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [68.4211,136.8421,373.3333,386.6667,654.5454,872.7272];
```

Test Instance-30: TAS2C4D3 (Test Assembly Setup-Profile_2 Capacity-Profile_4 Demand-Series_3)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [68.4211,136.8421,373.3333,386.6667,654.5454,872.7272];
```

Test Instance-31: TAS2C4D4 (Test Assembly Setup-Profile_2 Capacity-Profile_4 Demand-Series_4)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [68.4211,136.8421,373.3333,386.6667,654.5454,872.7272];
```

Test Instance-32: TAS2C4D5 (Test Assembly Setup-Profile_2 Capacity-Profile_4 Demand-Series_5)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [68.4211,136.8421,373.3333,386.6667,654.5454,872.7272];
```

Test Instance-33: TAS2C4D6 (Test Assembly Setup-Profile_2 Capacity-Profile_4 Demand-Series_6)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [68.4211,136.8421,373.3333,386.6667,654.5454,872.7272];
```

Test Instance-34: TAS2C4D7 (Test Assembly Setup-Profile_2 Capacity-Profile_4 Demand-Series_7)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [68.4211,136.8421,373.3333,386.6667,654.5454,872.7272];
```

Test Instance-35: TAS2C4D8 (Test Assembly Setup-Profile_2 Capacity-Profile_4 Demand-Series_8)

```
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 - II
setuptime = 
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost = 
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [68.4211,136.8421,373.3333,386.6667,654.5454,872.7272];
```

Test Instance-36: TAS2C4D9 (Test Assembly Setup-Profile_2 Capacity-Profile_4 Demand-Series_9)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [68.4211,136.8421,373.3333,386.6667,654.5454,872.7272];
```

Test Instance-37: TAS2C5D1 (Test Assembly Setup-Profile_2 Capacity-Profile_5 Demand-Series_1)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [118.1818,236.3636,373.3333,386.6667,378.9474,505.2632];
```

Test Instance-38: TAS2C5D2 (Test Assembly Setup-Profile_2 Capacity-Profile_5 Demand-Series_2)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [118.1818,236.3636,373.3333,386.6667,378.9474,505.2632];
```

Test Instance-39: TAS2C5D3 (Test Assembly Setup-Profile_2 Capacity-Profile_5 Demand-Series_3)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [118.1818,236.3636,373.3333,386.6667,378.9474,505.2632];
```

Test Instance-40: TAS2C5D4 (Test Assembly Setup-Profile_2 Capacity-Profile_5 Demand-Series_4)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [118.1818,236.3636,373.3333,386.6667,378.9474,505.2632];
```

Test Instance-41: TAS2C5D5 (Test Assembly Setup-Profile_2 Capacity-Profile_5 Demand-Series_5)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [118.1818,236.3636,373.3333,386.6667,378.9474,505.2632];
```

Test Instance-42: TAS2C5D6 (Test Assembly Setup-Profile_2 Capacity-Profile_5 Demand-Series_6)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [118.1818,236.3636,373.3333,386.6667,378.9474,505.2632];
```

Test Instance-43: TAS2C5D7 (Test Assembly Setup-Profile_2 Capacity-Profile_5 Demand-Series_7)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [118.1818,236.3636,373.3333,386.6667,378.9474,505.2632];
```

Test Instance-44: TAS2C5D8 (Test Assembly Setup-Profile_2 Capacity-Profile_5 Demand-Series_8)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [118.1818,236.3636,373.3333,386.6667,378.9474,505.2632];
```

Test Instance-45: TAS2C5D9 (Test Assembly Setup-Profile_2 Capacity-Profile_5 Demand-Series_9)

```
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 - II
setuptime =
[50,50,50,50,50,50,50,50,50,50,40,40,40,40,40,40,40,40,40,40,30,30,30,30,30,30,30,30,30,30,20,20,20,20,20,20,20,20,20,20];
setupcost =
[10,12.5,10,10,12.5,12.5,10,10,10,10,12.5,12.5,12.5,12.5,10,10,10,10,10,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,1
0,10,10,10,12.5,12.5,12.5,12.5,12.5,12.5];
// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [118.1818,236.3636,373.3333,386.6667,378.9474,505.2632];
```