

## Problem – B (General) → DATA

**Test Instance-1:** TGS1C1D1 (Test General Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_1)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 1
primary_demand = [[70.4900,70.0049,70.0000,70.0000],      //Product-1
                  [30.0900,30.0009,30.0000,30.0000],      //Products-2
                  [50.2500,50.0025,50.0000,50.0000],      //Prodcut-3
                  [101.0000,100.0100,100.0001,100.0000]];  //Product-4

secondary_demand = [
    [100.5800,100.0058,100.0000,100.0000],    //Product-5 (Sum of Product-1 & 2)
    [80.3400,80.0034,80.0000,80.0000],        //Product-6 (Sum of Prodcut-2 & 3)
    [151.2500,150.0125,150.0001,150.0000],    //Product-7 (Sum of Prodcut-3 & 4)
    [100.5800,100.0058,100.0000,100.0000],    //Product-8 (equal to Prodcut-5)
    [180.9200,180.0092,180.0000,180.0000],    //Product-9 (Sum of Prodcut-5 & 6)
    [231.5900,230.0159,230.0000,230.0000]];   //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,377.7778,711.1111];
```

## Test Instance-2: TGS1C1D2 (Test General Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_2)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 2
primary_demand = [[77.8400,70.0784,70.0008,70.0000], //Product-1
                  [31.4400,30.0144,30.0001,30.0000], //Products-2
                  [54.0000,50.0040,50.0004,50.0000], //Prodcut-3
                  [116.0000,100.1600,100.0016,100.0000]]; //Product-4

secondary_demand = [
    [109.2800,100.0928,100.0009,100.0000], //Product-5 (Sum of Product-1 & 2)
    [85.4400,80.0544,80.0005,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [170.0000,150.2000,150.0020,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [109.2800,100.0928,100.0009,100.0000], //Product-8 (equal to Prodcut-5)
    [194.7200,180.1472,180.0015,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [255.4400,230.2544,230.0025,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,377.7778,711.1111];
```

**Test Instance-3: TGS1C1D3 (Test General Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_3)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 3
primary_demand = [[94.0100,70.2401,70.0024,70.0000], //Product-1
                  [34.4100,30.0441,30.0004,30.0000], //Products-2
                  [62.2500,50.1225,50.0012,50.0000], //Prodcut-3
                  [149.0000,100.4900,100.0049,100.0000]]; //Product-4

secondary_demand = [
    [128.4200,100.2842,100.0028,100.0000], //Product-5 (Sum of Product-1 & 2)
    [96.6600,80.1666,80.0017,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [211.2500,150.6125,150.0061,150.0001], //Product-7 (Sum of Prodcut-3 & 4)
    [128.4200,100.2842,100.0028,100.0000], //Product-8 (equal to Prodcut-5)
    [225.0800,180.4508,180.0045,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [307.9100,230.7791,230.0078,230.0001]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,377.7778,711.1111];
```

#### Test Instance-4: TGS1C1D4 (Test General Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_4)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 4
primary_demand = [[71.1025,70.048,70.0006,70.0000],           //Product-1
                  [30.2025,30.0046,30.0001,30.0000],         //Products-2
                  [50.5625,50.0127,50.0003,50.0000],         //Prodcut-3
                  [102.2500,100.0506,100.0011,100.0000]];     //Product-4

secondary_demand = [
    [101.3050,100.0294,100.0007,100.0000],           //Product-5 (Sum of Product-1 & 2)
    [80.7650,80.0172,80.0004,80.0000],               //Product-6 (Sum of Prodcut-2 & 3)
    [152.8125,150.0633,150.0014,150.0000],           //Product-7 (Sum of Prodcut-3 & 4)
    [101.3050,100.0294,100.0007,100.0000],           //Product-8 (equal to Prodcut-5)
    [182.0700,180.0466,180.0010,180.0000],           //Product-9 (Sum of Prodcut-5 & 6)
    [233.5775,230.0805,230.0018,230.0000]];          //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,377.7778,711.1111];
```

### Test Instance-5: TGS1C1D5 (Test General Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_5)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 5
primary_demand = [[87.6400,70.3969,70.0089,70.0002], //Product-1
                  [33.2400,30.0729,30.0016,30.0000], //Products-2
                  [59.0000,50.2025,50.0046,50.0001], //Prodcut-3
                  [136.0000,100.8100,100.0182,100.0004]]; //Product-4

secondary_demand = [
    [120.8800,100.4698,100.0106,100.0002], //Product-5 (Sum of Product-1 & 2)
    [92.2400,80.2754,80.0062,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [195.0000,151.0125,150.0228,150.0005], //Product-7 (Sum of Prodcut-3 & 4)
    [120.8800,100.4698,100.0106,100.0002], //Product-8 (equal to Prodcut-5)
    [213.1200,180.7452,180.0168,180.0004], //Product-9 (Sum of Prodcut-5 & 6)
    [287.2400,231.2879,230.0290,230.0007]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,377.7778,711.1111];
```

### Test Instance-6: TGS1C1D6 (Test General Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_6)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 6
primary_demand = [[124.0225,71.2155,70.0273,70.0006], //Product-1
                  [39.9225,30.2233,30.0050,30.0001], //Products-2
                  [77.5625,50.6202,50.0140,50.0003], //Prodcut-3
                  [210.2500,102.4806,100.0558,100.0013]]; //Product-4

secondary_demand = [
    [163.9450,101.4388,100.0324,100.0007], //Product-5 (Sum of Product-1 & 2)
    [117.4850,80.8434,80.0190,80.0004], //Product-6 (Sum of Prodcut-2 & 3)
    [287.8125,153.1008,150.0698,150.0016], //Product-7 (Sum of Prodcut-3 & 4)
    [163.9450,101.4388,100.0324,100.0007], //Product-8 (equal to Prodcut-5)
    [281.4300,182.2822,180.0513,180.0012], //Product-9 (Sum of Prodcut-5 & 6)
    [405.2975,233.9442,230.0887,230.0020]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,377.7778,711.1111];
```

### Test Instance-7: TGS1C1D7 (Test General Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_7)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 7
primary_demand = [[71.9600,70.0784,70.0031,70.0001], //Product-1
                  [30.3600,30.0144,30.0006,30.0000], //Products-2
                  [51.0000,50.0400,50.0016,50.0001], //Prodcut-3
                  [104.0000,100.1600,100.0064,100.0003]]; //Product-4

secondary_demand = [
    [102.3200,100.0928,100.0037,100.0001], //Product-5 (Sum of Product-1 & 2)
    [81.3600,80.0544,80.0022,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [155.0000,150.2000,150.0080,150.0003], //Product-7 (Sum of Prodcut-3 & 4)
    [102.3200,100.0928,100.0037,100.0001], //Product-8 (equal to Prodcut-5)
    [183.6800,180.1472,180.0059,180.0002], //Product-9 (Sum of Prodcut-5 & 6)
    [236.3600,230.2544,230.0102,230.0004]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,377.7778,711.1111];
```

### Test Instance-8: TGS1C1D8 (Test General Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_8)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 8
primary_demand = [[101.3600,71.2544,70.0502,70.0020], //Product-1
                  [35.7600,30.2304,30.0092,30.0004], //Products-2
                  [66.0000,50.6400,50.0256,50.0010], //Prodcut-3
                  [164.0000,102.5600,100.1024,100.0041]]; //Product-4

secondary_demand = [
    [137.1200,101.4848,100.0594,100.0024], //Product-5 (Sum of Product-1 & 2)
    [101.7600,80.8704,80.0348,80.0014], //Product-6 (Sum of Prodcut-2 & 3)
    [230.0000,153.2000,150.1280,150.0051], //Product-7 (Sum of Prodcut-3 & 4)
    [137.1200,101.4848,100.0594,100.0024], //Product-8 (equal to Prodcut-5)
    [238.8800,182.3552,180.0942,180.0038], //Product-9 (Sum of Prodcut-5 & 6)
    [331.7600,234.0704,230.1628,230.0065]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,377.7778,711.1111];
```



### Test Instance-9: TGS1C1D9 (Test General Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_9)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 9
primary_demand = [[166.0400,73.8416,70.1537,70.0061], //Product-1
                  [47.6400,30.7056,30.0282,30.0011], //Products-2
                  [99.0000,51.9600,50.0784,50.0031], //Prodcut-3
                  [296.0000,107.8400,100.3136,100.0125]]; //Product-4

secondary_demand = [
    [213.6800,104.5472,100.1819,100.0073], //Product-5 (Sum of Product-1 & 2)
    [146.6400,82.6656,80.1066,80.0043], //Product-6 (Sum of Prodcut-2 & 3)
    [395.0000,159.8000,150.3920,150.0157], //Product-7 (Sum of Prodcut-3 & 4)
    [213.6800,104.5472,100.1819,100.0073], //Product-8 (equal to Prodcut-5)
    [360.3200,187.2128,180.2885,180.0115], //Product-9 (Sum of Prodcut-5 & 6)
    [541.6400,242.4656,230.4986,230.0199]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,377.7778,711.1111];
```

### Test Instance-10: TGS1C2D1 (Test General Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_1)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 1
primary_demand = [[70.4900,70.0049,70.0000,70.0000], //Product-1
                  [30.0900,30.0009,30.0000,30.0000], //Products-2
                  [50.2500,50.0025,50.0000,50.0000], //Prodcut-3
                  [101.0000,100.0100,100.0001,100.0000]]; //Product-4

secondary_demand = [
    [100.5800,100.0058,100.0000,100.0000], //Product-5 (Sum of Product-1 & 2)
    [80.3400,80.0034,80.0000,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [151.2500,150.0125,150.0001,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [100.5800,100.0058,100.0000,100.0000], //Product-8 (equal to Prodcut-5)
    [180.9200,180.0092,180.0000,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [231.5900,230.0159,230.0000,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

**Test Instance-11: TGS1C2D2 (Test General Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_2)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 2
primary_demand = [[77.8400,70.0784,70.0008,70.0000], //Product-1
                  [31.4400,30.0144,30.0001,30.0000], //Products-2
                  [54.0000,50.0040,50.0004,50.0000], //Prodcut-3
                  [116.0000,100.1600,100.0016,100.0000]]; //Product-4

secondary_demand = [
    [109.2800,100.0928,100.0009,100.0000], //Product-5 (Sum of Product-1 & 2)
    [85.4400,80.0544,80.0005,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [170.0000,150.2000,150.0020,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [109.2800,100.0928,100.0009,100.0000], //Product-8 (equal to Prodcut-5)
    [194.7200,180.1472,180.0015,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [255.4400,230.2544,230.0025,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

### Test Instance-12: TGS1C2D3 (Test General Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_3)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 3
primary_demand = [[94.0100,70.2401,70.0024,70.0000], //Product-1
                  [34.4100,30.0441,30.0004,30.0000], //Products-2
                  [62.2500,50.1225,50.0012,50.0000], //Prodcut-3
                  [149.0000,100.4900,100.0049,100.0000]]; //Product-4

secondary_demand = [
    [128.4200,100.2842,100.0028,100.0000], //Product-5 (Sum of Product-1 & 2)
    [96.6600,80.1666,80.0017,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [211.2500,150.6125,150.0061,150.0001], //Product-7 (Sum of Prodcut-3 & 4)
    [128.4200,100.2842,100.0028,100.0000], //Product-8 (equal to Prodcut-5)
    [225.0800,180.4508,180.0045,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [307.9100,230.7791,230.0078,230.0001]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

**Test Instance-13: TGS1C2D4 (Test General Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_4)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 4
primary_demand = [[71.1025,70.048,70.0006,70.0000],           //Product-1
                  [30.2025,30.0046,30.0001,30.0000],         //Products-2
                  [50.5625,50.0127,50.0003,50.0000],         //Prodcut-3
                  [102.2500,100.0506,100.0011,100.0000]];     //Product-4

secondary_demand = [
    [101.3050,100.0294,100.0007,100.0000],           //Product-5 (Sum of Product-1 & 2)
    [80.7650,80.0172,80.0004,80.0000],               //Product-6 (Sum of Prodcut-2 & 3)
    [152.8125,150.0633,150.0014,150.0000],           //Product-7 (Sum of Prodcut-3 & 4)
    [101.3050,100.0294,100.0007,100.0000],           //Product-8 (equal to Prodcut-5)
    [182.0700,180.0466,180.0010,180.0000],           //Product-9 (Sum of Prodcut-5 & 6)
    [233.5775,230.0805,230.0018,230.0000]];          //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

#### Test Instance-14: TGS1C2D5 (Test General Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_5)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 5
primary_demand = [[87.6400,70.3969,70.0089,70.0002], //Product-1
                  [33.2400,30.0729,30.0016,30.0000], //Products-2
                  [59.0000,50.2025,50.0046,50.0001], //Prodcut-3
                  [136.0000,100.8100,100.0182,100.0004]]; //Product-4

secondary_demand = [
    [120.8800,100.4698,100.0106,100.0002], //Product-5 (Sum of Product-1 & 2)
    [92.2400,80.2754,80.0062,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [195.0000,151.0125,150.0228,150.0005], //Product-7 (Sum of Prodcut-3 & 4)
    [120.8800,100.4698,100.0106,100.0002], //Product-8 (equal to Prodcut-5)
    [213.1200,180.7452,180.0168,180.0004], //Product-9 (Sum of Prodcut-5 & 6)
    [287.2400,231.2879,230.0290,230.0007]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

**Test Instance-15: TGS1C2D6 (Test General Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_6)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 6
primary_demand = [[124.0225,71.2155,70.0273,70.0006], //Product-1
                  [39.9225,30.2233,30.0050,30.0001], //Products-2
                  [77.5625,50.6202,50.0140,50.0003], //Prodcut-3
                  [210.2500,102.4806,100.0558,100.0013]]; //Product-4

secondary_demand = [
    [163.9450,101.4388,100.0324,100.0007], //Product-5 (Sum of Product-1 & 2)
    [117.4850,80.8434,80.0190,80.0004], //Product-6 (Sum of Prodcut-2 & 3)
    [287.8125,153.1008,150.0698,150.0016], //Product-7 (Sum of Prodcut-3 & 4)
    [163.9450,101.4388,100.0324,100.0007], //Product-8 (equal to Prodcut-5)
    [281.4300,182.2822,180.0513,180.0012], //Product-9 (Sum of Prodcut-5 & 6)
    [405.2975,233.9442,230.0887,230.0020]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

**Test Instance-16: TGS1C2D7 (Test General Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_7)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 7
primary_demand = [[71.9600,70.0784,70.0031,70.0001], //Product-1
                  [30.3600,30.0144,30.0006,30.0000], //Products-2
                  [51.0000,50.0400,50.0016,50.0001], //Prodcut-3
                  [104.0000,100.1600,100.0064,100.0003]]; //Product-4

secondary_demand = [
    [102.3200,100.0928,100.0037,100.0001], //Product-5 (Sum of Product-1 & 2)
    [81.3600,80.0544,80.0022,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [155.0000,150.2000,150.0080,150.0003], //Product-7 (Sum of Prodcut-3 & 4)
    [102.3200,100.0928,100.0037,100.0001], //Product-8 (equal to Prodcut-5)
    [183.6800,180.1472,180.0059,180.0002], //Product-9 (Sum of Prodcut-5 & 6)
    [236.3600,230.2544,230.0102,230.0004]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```



**Test Instance-17: TGS1C2D8 (Test General Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_8)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 8
primary_demand = [[101.3600,71.2544,70.0502,70.0020], //Product-1
                  [35.7600,30.2304,30.0092,30.0004], //Products-2
                  [66.0000,50.6400,50.0256,50.0010], //Prodcut-3
                  [164.0000,102.5600,100.1024,100.0041]]; //Product-4

secondary_demand = [
    [137.1200,101.4848,100.0594,100.0024], //Product-5 (Sum of Product-1 & 2)
    [101.7600,80.8704,80.0348,80.0014], //Product-6 (Sum of Prodcut-2 & 3)
    [230.0000,153.2000,150.1280,150.0051], //Product-7 (Sum of Prodcut-3 & 4)
    [137.1200,101.4848,100.0594,100.0024], //Product-8 (equal to Prodcut-5)
    [238.8800,182.3552,180.0942,180.0038], //Product-9 (Sum of Prodcut-5 & 6)
    [331.7600,234.0704,230.1628,230.0065]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

**Test Instance-18: TGS1C2D9 (Test General Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_9)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 9
primary_demand = [[166.0400,73.8416,70.1537,70.0061], //Product-1
                  [47.6400,30.7056,30.0282,30.0011], //Products-2
                  [99.0000,51.9600,50.0784,50.0031], //Prodcut-3
                  [296.0000,107.8400,100.3136,100.0125]]; //Product-4

secondary_demand = [
    [213.6800,104.5472,100.1819,100.0073], //Product-5 (Sum of Product-1 & 2)
    [146.6400,82.6656,80.1066,80.0043], //Product-6 (Sum of Prodcut-2 & 3)
    [395.0000,159.8000,150.3920,150.0157], //Product-7 (Sum of Prodcut-3 & 4)
    [213.6800,104.5472,100.1819,100.0073], //Product-8 (equal to Prodcut-5)
    [360.3200,187.2128,180.2885,180.0115], //Product-9 (Sum of Prodcut-5 & 6)
    [541.6400,242.4656,230.4986,230.0199]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

### Test Instance-19: TGS1C3D1 (Test General Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_1)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 1
primary_demand = [[70.4900,70.0049,70.0000,70.0000], //Product-1
                  [30.0900,30.0009,30.0000,30.0000], //Products-2
                  [50.2500,50.0025,50.0000,50.0000], //Prodcut-3
                  [101.0000,100.0100,100.0001,100.0000]]; //Product-4

secondary_demand = [
    [100.5800,100.0058,100.0000,100.0000], //Product-5 (Sum of Product-1 & 2)
    [80.3400,80.0034,80.0000,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [151.2500,150.0125,150.0001,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [100.5800,100.0058,100.0000,100.0000], //Product-8 (equal to Prodcut-5)
    [180.9200,180.0092,180.0000,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [231.5900,230.0159,230.0000,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,680.0000,1280.0000];
```

**Test Instance-20: TGS1C3D2 (Test General Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_2)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 2
primary_demand = [[77.8400,70.0784,70.0008,70.0000], //Product-1
                  [31.4400,30.0144,30.0001,30.0000], //Products-2
                  [54.0000,50.0040,50.0004,50.0000], //Prodcut-3
                  [116.0000,100.1600,100.0016,100.0000]]; //Product-4

secondary_demand = [
    [109.2800,100.0928,100.0009,100.0000], //Product-5 (Sum of Product-1 & 2)
    [85.4400,80.0544,80.0005,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [170.0000,150.2000,150.0020,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [109.2800,100.0928,100.0009,100.0000], //Product-8 (equal to Prodcut-5)
    [194.7200,180.1472,180.0015,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [255.4400,230.2544,230.0025,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,680.0000,1280.0000];
```

**Test Instance-21: TGS1C3D3 (Test General Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_3)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 3
primary_demand = [[94.0100,70.2401,70.0024,70.0000], //Product-1
                  [34.4100,30.0441,30.0004,30.0000], //Products-2
                  [62.2500,50.1225,50.0012,50.0000], //Prodcut-3
                  [149.0000,100.4900,100.0049,100.0000]]; //Product-4

secondary_demand = [
    [128.4200,100.2842,100.0028,100.0000], //Product-5 (Sum of Product-1 & 2)
    [96.6600,80.1666,80.0017,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [211.2500,150.6125,150.0061,150.0001], //Product-7 (Sum of Prodcut-3 & 4)
    [128.4200,100.2842,100.0028,100.0000], //Product-8 (equal to Prodcut-5)
    [225.0800,180.4508,180.0045,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [307.9100,230.7791,230.0078,230.0001]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,680.0000,1280.0000];
```

### Test Instance-22: TGS1C3D4 (Test General Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_4)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 4
primary_demand = [[71.1025,70.048,70.0006,70.0000],           //Product-1
                  [30.2025,30.0046,30.0001,30.0000],           //Products-2
                  [50.5625,50.0127,50.0003,50.0000],           //Prodcut-3
                  [102.2500,100.0506,100.0011,100.0000]];       //Product-4

secondary_demand = [
    [101.3050,100.0294,100.0007,100.0000],           //Product-5 (Sum of Product-1 & 2)
    [80.7650,80.0172,80.0004,80.0000],               //Product-6 (Sum of Prodcut-2 & 3)
    [152.8125,150.0633,150.0014,150.0000],           //Product-7 (Sum of Prodcut-3 & 4)
    [101.3050,100.0294,100.0007,100.0000],           //Product-8 (equal to Prodcut-5)
    [182.0700,180.0466,180.0010,180.0000],           //Product-9 (Sum of Prodcut-5 & 6)
    [233.5775,230.0805,230.0018,230.0000]];          //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,680.0000,1280.0000];
```

**Test Instance-23: TGS1C3D5 (Test General Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_5)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 5
primary_demand = [[87.6400,70.3969,70.0089,70.0002],      //Product-1
                  [33.2400,30.0729,30.0016,30.0000],      //Products-2
                  [59.0000,50.2025,50.0046,50.0001],      //Prodcut-3
                  [136.0000,100.8100,100.0182,100.0004]]]; //Product-4

secondary_demand = [
    [120.8800,100.4698,100.0106,100.0002],      //Product-5 (Sum of Product-1 & 2)
    [92.2400,80.2754,80.0062,80.0001],          //Product-6 (Sum of Prodcut-2 & 3)
    [195.0000,151.0125,150.0228,150.0005],      //Product-7 (Sum of Prodcut-3 & 4)
    [120.8800,100.4698,100.0106,100.0002],      //Product-8 (equal to Prodcut-5)
    [213.1200,180.7452,180.0168,180.0004],      //Product-9 (Sum of Prodcut-5 & 6)
    [287.2400,231.2879,230.0290,230.0007]]];      //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,680.0000,1280.0000];
```

**Test Instance-24: TGS1C3D6 (Test General Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_6)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 6
primary_demand = [[124.0225,71.2155,70.0273,70.0006],      //Product-1
                  [39.9225,30.2233,30.0050,30.0001],      //Products-2
                  [77.5625,50.6202,50.0140,50.0003],      //Prodcut-3
                  [210.2500,102.4806,100.0558,100.0013]]; //Product-4

secondary_demand = [
    [163.9450,101.4388,100.0324,100.0007], //Product-5 (Sum of Product-1 & 2)
    [117.4850,80.8434,80.0190,80.0004],    //Product-6 (Sum of Prodcut-2 & 3)
    [287.8125,153.1008,150.0698,150.0016], //Product-7 (Sum of Prodcut-3 & 4)
    [163.9450,101.4388,100.0324,100.0007], //Product-8 (equal to Prodcut-5)
    [281.4300,182.2822,180.0513,180.0012], //Product-9 (Sum of Prodcut-5 & 6)
    [405.2975,233.9442,230.0887,230.0020]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,680.0000,1280.0000];
```



**Test Instance-25: TGS1C3D7 (Test General Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_7)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 7
primary_demand = [[71.9600,70.0784,70.0031,70.0001], //Product-1
                  [30.3600,30.0144,30.0006,30.0000], //Products-2
                  [51.0000,50.0400,50.0016,50.0001], //Prodcut-3
                  [104.0000,100.1600,100.0064,100.0003]]; //Product-4

secondary_demand = [
    [102.3200,100.0928,100.0037,100.0001], //Product-5 (Sum of Product-1 & 2)
    [81.3600,80.0544,80.0022,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [155.0000,150.2000,150.0080,150.0003], //Product-7 (Sum of Prodcut-3 & 4)
    [102.3200,100.0928,100.0037,100.0001], //Product-8 (equal to Prodcut-5)
    [183.6800,180.1472,180.0059,180.0002], //Product-9 (Sum of Prodcut-5 & 6)
    [236.3600,230.2544,230.0102,230.0004]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,680.0000,1280.0000];
```

### Test Instance-26: TGS1C3D8 (Test General Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_8)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 8
primary_demand = [[101.3600,71.2544,70.0502,70.0020], //Product-1
                  [35.7600,30.2304,30.0092,30.0004], //Products-2
                  [66.0000,50.6400,50.0256,50.0010], //Prodcut-3
                  [164.0000,102.5600,100.1024,100.0041]]; //Product-4

secondary_demand = [
    [137.1200,101.4848,100.0594,100.0024], //Product-5 (Sum of Product-1 & 2)
    [101.7600,80.8704,80.0348,80.0014], //Product-6 (Sum of Prodcut-2 & 3)
    [230.0000,153.2000,150.1280,150.0051], //Product-7 (Sum of Prodcut-3 & 4)
    [137.1200,101.4848,100.0594,100.0024], //Product-8 (equal to Prodcut-5)
    [238.8800,182.3552,180.0942,180.0038], //Product-9 (Sum of Prodcut-5 & 6)
    [331.7600,234.0704,230.1628,230.0065]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,680.0000,1280.0000];
```

**Test Instance-27: TGS1C3D9 (Test General Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_9)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 9
primary_demand = [[166.0400,73.8416,70.1537,70.0061], //Product-1
                  [47.6400,30.7056,30.0282,30.0011], //Products-2
                  [99.0000,51.9600,50.0784,50.0031], //Prodcut-3
                  [296.0000,107.8400,100.3136,100.0125]]; //Product-4

secondary_demand = [
    [213.6800,104.5472,100.1819,100.0073], //Product-5 (Sum of Product-1 & 2)
    [146.6400,82.6656,80.1066,80.0043], //Product-6 (Sum of Prodcut-2 & 3)
    [395.0000,159.8000,150.3920,150.0157], //Product-7 (Sum of Prodcut-3 & 4)
    [213.6800,104.5472,100.1819,100.0073], //Product-8 (equal to Prodcut-5)
    [360.3200,187.2128,180.2885,180.0115], //Product-9 (Sum of Prodcut-5 & 6)
    [541.6400,242.4656,230.4986,230.0199]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,680.0000,1280.0000];
```

**Test Instance-28: TGS1C4D1 (Test General Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_1)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 1
primary_demand = [[70.4900,70.0049,70.0000,70.0000], //Product-1
                  [30.0900,30.0009,30.0000,30.0000], //Products-2
                  [50.2500,50.0025,50.0000,50.0000], //Prodcut-3
                  [101.0000,100.0100,100.0001,100.0000]]; //Product-4

secondary_demand = [
    [100.5800,100.0058,100.0000,100.0000], //Product-5 (Sum of Product-1 & 2)
    [80.3400,80.0034,80.0000,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [151.2500,150.0125,150.0001,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [100.5800,100.0058,100.0000,100.0000], //Product-8 (equal to Prodcut-5)
    [180.9200,180.0092,180.0000,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [231.5900,230.0159,230.0000,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,485.7143,1280.0000];
```

**Test Instance-29: TGS1C4D2 (Test General Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_2)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 2
primary_demand = [[77.8400,70.0784,70.0008,70.0000], //Product-1
                  [31.4400,30.0144,30.0001,30.0000], //Products-2
                  [54.0000,50.0040,50.0004,50.0000], //Prodcut-3
                  [116.0000,100.1600,100.0016,100.0000]]; //Product-4

secondary_demand = [
    [109.2800,100.0928,100.0009,100.0000], //Product-5 (Sum of Product-1 & 2)
    [85.4400,80.0544,80.0005,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [170.0000,150.2000,150.0020,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [109.2800,100.0928,100.0009,100.0000], //Product-8 (equal to Prodcut-5)
    [194.7200,180.1472,180.0015,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [255.4400,230.2544,230.0025,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,485.7143,1280.0000];
```

**Test Instance-30: TGS1C4D3 (Test General Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_3)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 3
primary_demand = [[94.0100,70.2401,70.0024,70.0000], //Product-1
                  [34.4100,30.0441,30.0004,30.0000], //Products-2
                  [62.2500,50.1225,50.0012,50.0000], //Prodcut-3
                  [149.0000,100.4900,100.0049,100.0000]]; //Product-4

secondary_demand = [
    [128.4200,100.2842,100.0028,100.0000], //Product-5 (Sum of Product-1 & 2)
    [96.6600,80.1666,80.0017,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [211.2500,150.6125,150.0061,150.0001], //Product-7 (Sum of Prodcut-3 & 4)
    [128.4200,100.2842,100.0028,100.0000], //Product-8 (equal to Prodcut-5)
    [225.0800,180.4508,180.0045,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [307.9100,230.7791,230.0078,230.0001]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,485.7143,1280.0000];
```

**Test Instance-31: TGS1C4D4 (Test General Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_4)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 4
primary_demand = [[71.1025,70.048,70.0006,70.0000],           //Product-1
                  [30.2025,30.0046,30.0001,30.0000],         //Products-2
                  [50.5625,50.0127,50.0003,50.0000],         //Prodcut-3
                  [102.2500,100.0506,100.0011,100.0000]];     //Product-4

secondary_demand = [
    [101.3050,100.0294,100.0007,100.0000],           //Product-5 (Sum of Product-1 & 2)
    [80.7650,80.0172,80.0004,80.0000],               //Product-6 (Sum of Prodcut-2 & 3)
    [152.8125,150.0633,150.0014,150.0000],           //Product-7 (Sum of Prodcut-3 & 4)
    [101.3050,100.0294,100.0007,100.0000],           //Product-8 (equal to Prodcut-5)
    [182.0700,180.0466,180.0010,180.0000],           //Product-9 (Sum of Prodcut-5 & 6)
    [233.5775,230.0805,230.0018,230.0000]];          //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,485.7143,1280.0000];
```

**Test Instance-32: TGS1C4D5 (Test General Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_5)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 5
primary_demand = [[87.6400,70.3969,70.0089,70.0002], //Product-1
                  [33.2400,30.0729,30.0016,30.0000], //Products-2
                  [59.0000,50.2025,50.0046,50.0001], //Prodcut-3
                  [136.0000,100.8100,100.0182,100.0004]]]; //Product-4

secondary_demand = [
    [120.8800,100.4698,100.0106,100.0002], //Product-5 (Sum of Product-1 & 2)
    [92.2400,80.2754,80.0062,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [195.0000,151.0125,150.0228,150.0005], //Product-7 (Sum of Prodcut-3 & 4)
    [120.8800,100.4698,100.0106,100.0002], //Product-8 (equal to Prodcut-5)
    [213.1200,180.7452,180.0168,180.0004], //Product-9 (Sum of Prodcut-5 & 6)
    [287.2400,231.2879,230.0290,230.0007]]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,485.7143,1280.0000];
```



**Test Instance-33: TGS1C4D6 (Test General Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_6)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 6
primary_demand = [[124.0225,71.2155,70.0273,70.0006], //Product-1
                  [39.9225,30.2233,30.0050,30.0001], //Products-2
                  [77.5625,50.6202,50.0140,50.0003], //Prodcut-3
                  [210.2500,102.4806,100.0558,100.0013]]; //Product-4

secondary_demand = [
    [163.9450,101.4388,100.0324,100.0007], //Product-5 (Sum of Product-1 & 2)
    [117.4850,80.8434,80.0190,80.0004], //Product-6 (Sum of Prodcut-2 & 3)
    [287.8125,153.1008,150.0698,150.0016], //Product-7 (Sum of Prodcut-3 & 4)
    [163.9450,101.4388,100.0324,100.0007], //Product-8 (equal to Prodcut-5)
    [281.4300,182.2822,180.0513,180.0012], //Product-9 (Sum of Prodcut-5 & 6)
    [405.2975,233.9442,230.0887,230.0020]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,485.7143,1280.0000];
```

### Test Instance-34: TGS1C4D7 (Test General Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_7)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 7
primary_demand = [[71.9600,70.0784,70.0031,70.0001], //Product-1
                  [30.3600,30.0144,30.0006,30.0000], //Products-2
                  [51.0000,50.0400,50.0016,50.0001], //Prodcut-3
                  [104.0000,100.1600,100.0064,100.0003]]; //Product-4

secondary_demand = [
    [102.3200,100.0928,100.0037,100.0001], //Product-5 (Sum of Product-1 & 2)
    [81.3600,80.0544,80.0022,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [155.0000,150.2000,150.0080,150.0003], //Product-7 (Sum of Prodcut-3 & 4)
    [102.3200,100.0928,100.0037,100.0001], //Product-8 (equal to Prodcut-5)
    [183.6800,180.1472,180.0059,180.0002], //Product-9 (Sum of Prodcut-5 & 6)
    [236.3600,230.2544,230.0102,230.0004]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,485.7143,1280.0000];
```

**Test Instance-35: TGS1C4D8 (Test General Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_8)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 8
primary_demand = [[101.3600,71.2544,70.0502,70.0020], //Product-1
                  [35.7600,30.2304,30.0092,30.0004], //Products-2
                  [66.0000,50.6400,50.0256,50.0010], //Prodcut-3
                  [164.0000,102.5600,100.1024,100.0041]]; //Product-4

secondary_demand = [
    [137.1200,101.4848,100.0594,100.0024], //Product-5 (Sum of Product-1 & 2)
    [101.7600,80.8704,80.0348,80.0014], //Product-6 (Sum of Prodcut-2 & 3)
    [230.0000,153.2000,150.1280,150.0051], //Product-7 (Sum of Prodcut-3 & 4)
    [137.1200,101.4848,100.0594,100.0024], //Product-8 (equal to Prodcut-5)
    [238.8800,182.3552,180.0942,180.0038], //Product-9 (Sum of Prodcut-5 & 6)
    [331.7600,234.0704,230.1628,230.0065]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,485.7143,1280.0000];
```

**Test Instance-36: TGS1C4D9 (Test General Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_9)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 9
primary_demand = [[166.0400,73.8416,70.1537,70.0061], //Product-1
                  [47.6400,30.7056,30.0282,30.0011], //Products-2
                  [99.0000,51.9600,50.0784,50.0031], //Prodcut-3
                  [296.0000,107.8400,100.3136,100.0125]]; //Product-4

secondary_demand = [
    [213.6800,104.5472,100.1819,100.0073], //Product-5 (Sum of Product-1 & 2)
    [146.6400,82.6656,80.1066,80.0043], //Product-6 (Sum of Prodcut-2 & 3)
    [395.0000,159.8000,150.3920,150.0157], //Product-7 (Sum of Prodcut-3 & 4)
    [213.6800,104.5472,100.1819,100.0073], //Product-8 (equal to Prodcut-5)
    [360.3200,187.2128,180.2885,180.0115], //Product-9 (Sum of Prodcut-5 & 6)
    [541.6400,242.4656,230.4986,230.0199]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,485.7143,1280.0000];
```

**Test Instance-37: TGS1C5D1 (Test General Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_1)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 1
primary_demand = [[70.4900,70.0049,70.0000,70.0000], //Product-1
                  [30.0900,30.0009,30.0000,30.0000], //Products-2
                  [50.2500,50.0025,50.0000,50.0000], //Prodcut-3
                  [101.0000,100.0100,100.0001,100.0000]]; //Product-4

secondary_demand = [
    [100.5800,100.0058,100.0000,100.0000], //Product-5 (Sum of Product-1 & 2)
    [80.3400,80.0034,80.0000,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [151.2500,150.0125,150.0001,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [100.5800,100.0058,100.0000,100.0000], //Product-8 (equal to Prodcut-5)
    [180.9200,180.0092,180.0000,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [231.5900,230.0159,230.0000,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,485.7143,711.1111];
```

**Test Instance-38: TGS1C5D2 (Test General Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_2)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 2
primary_demand = [[77.8400,70.0784,70.0008,70.0000], //Product-1
                  [31.4400,30.0144,30.0001,30.0000], //Products-2
                  [54.0000,50.0040,50.0004,50.0000], //Prodcut-3
                  [116.0000,100.1600,100.0016,100.0000]]; //Product-4

secondary_demand = [
    [109.2800,100.0928,100.0009,100.0000], //Product-5 (Sum of Product-1 & 2)
    [85.4400,80.0544,80.0005,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [170.0000,150.2000,150.0020,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [109.2800,100.0928,100.0009,100.0000], //Product-8 (equal to Prodcut-5)
    [194.7200,180.1472,180.0015,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [255.4400,230.2544,230.0025,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,485.7143,711.1111];
```

**Test Instance-39: TGS1C5D3 (Test General Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_3)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 3
primary_demand = [[94.0100,70.2401,70.0024,70.0000], //Product-1
                  [34.4100,30.0441,30.0004,30.0000], //Products-2
                  [62.2500,50.1225,50.0012,50.0000], //Prodcut-3
                  [149.0000,100.4900,100.0049,100.0000]]; //Product-4

secondary_demand = [
    [128.4200,100.2842,100.0028,100.0000], //Product-5 (Sum of Product-1 & 2)
    [96.6600,80.1666,80.0017,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [211.2500,150.6125,150.0061,150.0001], //Product-7 (Sum of Prodcut-3 & 4)
    [128.4200,100.2842,100.0028,100.0000], //Product-8 (equal to Prodcut-5)
    [225.0800,180.4508,180.0045,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [307.9100,230.7791,230.0078,230.0001]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,485.7143,711.1111];
```

**Test Instance-40: TGS1C5D4 (Test General Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_4)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 4
primary_demand = [[71.1025,70.048,70.0006,70.0000],           //Product-1
                  [30.2025,30.0046,30.0001,30.0000],         //Products-2
                  [50.5625,50.0127,50.0003,50.0000],         //Prodcut-3
                  [102.2500,100.0506,100.0011,100.0000]];     //Product-4

secondary_demand = [
    [101.3050,100.0294,100.0007,100.0000],           //Product-5 (Sum of Product-1 & 2)
    [80.7650,80.0172,80.0004,80.0000],               //Product-6 (Sum of Prodcut-2 & 3)
    [152.8125,150.0633,150.0014,150.0000],           //Product-7 (Sum of Prodcut-3 & 4)
    [101.3050,100.0294,100.0007,100.0000],           //Product-8 (equal to Prodcut-5)
    [182.0700,180.0466,180.0010,180.0000],           //Product-9 (Sum of Prodcut-5 & 6)
    [233.5775,230.0805,230.0018,230.0000]];          //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,485.7143,711.1111];
```



**Test Instance-41: TGS1C5D5 (Test General Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_5)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 5
primary_demand = [[87.6400,70.3969,70.0089,70.0002], //Product-1
                  [33.2400,30.0729,30.0016,30.0000], //Products-2
                  [59.0000,50.2025,50.0046,50.0001], //Prodcut-3
                  [136.0000,100.8100,100.0182,100.0004]]]; //Product-4

secondary_demand = [
    [120.8800,100.4698,100.0106,100.0002], //Product-5 (Sum of Product-1 & 2)
    [92.2400,80.2754,80.0062,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [195.0000,151.0125,150.0228,150.0005], //Product-7 (Sum of Prodcut-3 & 4)
    [120.8800,100.4698,100.0106,100.0002], //Product-8 (equal to Prodcut-5)
    [213.1200,180.7452,180.0168,180.0004], //Product-9 (Sum of Prodcut-5 & 6)
    [287.2400,231.2879,230.0290,230.0007]]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,485.7143,711.1111];
```

### Test Instance-42: TGS1C5D6 (Test General Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_6)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 6
primary_demand = [[124.0225,71.2155,70.0273,70.0006],      //Product-1
                  [39.9225,30.2233,30.0050,30.0001],      //Products-2
                  [77.5625,50.6202,50.0140,50.0003],      //Prodcut-3
                  [210.2500,102.4806,100.0558,100.0013]];  //Product-4

secondary_demand = [
    [163.9450,101.4388,100.0324,100.0007],                //Product-5 (Sum of Product-1 & 2)
    [117.4850,80.8434,80.0190,80.0004],                  //Product-6 (Sum of Prodcut-2 & 3)
    [287.8125,153.1008,150.0698,150.0016],                //Product-7 (Sum of Prodcut-3 & 4)
    [163.9450,101.4388,100.0324,100.0007],                //Product-8 (equal to Prodcut-5)
    [281.4300,182.2822,180.0513,180.0012],                //Product-9 (Sum of Prodcut-5 & 6)
    [405.2975,233.9442,230.0887,230.0020]];               //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,485.7143,711.1111];
```

**Test Instance-43: TGS1C5D7 (Test General Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_7)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 7
primary_demand = [[71.9600,70.0784,70.0031,70.0001], //Product-1
                  [30.3600,30.0144,30.0006,30.0000], //Products-2
                  [51.0000,50.0400,50.0016,50.0001], //Prodcut-3
                  [104.0000,100.1600,100.0064,100.0003]]; //Product-4

secondary_demand = [
    [102.3200,100.0928,100.0037,100.0001], //Product-5 (Sum of Product-1 & 2)
    [81.3600,80.0544,80.0022,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [155.0000,150.2000,150.0080,150.0003], //Product-7 (Sum of Prodcut-3 & 4)
    [102.3200,100.0928,100.0037,100.0001], //Product-8 (equal to Prodcut-5)
    [183.6800,180.1472,180.0059,180.0002], //Product-9 (Sum of Prodcut-5 & 6)
    [236.3600,230.2544,230.0102,230.0004]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,485.7143,711.1111];
```

**Test Instance-44: TGS1C5D8 (Test General Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_8)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 8
primary_demand = [[101.3600,71.2544,70.0502,70.0020], //Product-1
                  [35.7600,30.2304,30.0092,30.0004], //Products-2
                  [66.0000,50.6400,50.0256,50.0010], //Prodcut-3
                  [164.0000,102.5600,100.1024,100.0041]]; //Product-4

secondary_demand = [
    [137.1200,101.4848,100.0594,100.0024], //Product-5 (Sum of Product-1 & 2)
    [101.7600,80.8704,80.0348,80.0014], //Product-6 (Sum of Prodcut-2 & 3)
    [230.0000,153.2000,150.1280,150.0051], //Product-7 (Sum of Prodcut-3 & 4)
    [137.1200,101.4848,100.0594,100.0024], //Product-8 (equal to Prodcut-5)
    [238.8800,182.3552,180.0942,180.0038], //Product-9 (Sum of Prodcut-5 & 6)
    [331.7600,234.0704,230.1628,230.0065]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,485.7143,711.1111];
```

**Test Instance-45: TGS1C5D9 (Test General Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_9)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 9
primary_demand = [[166.0400,73.8416,70.1537,70.0061], //Product-1
                  [47.6400,30.7056,30.0282,30.0011], //Products-2
                  [99.0000,51.9600,50.0784,50.0031], //Prodcut-3
                  [296.0000,107.8400,100.3136,100.0125]]; //Product-4

secondary_demand = [
    [213.6800,104.5472,100.1819,100.0073], //Product-5 (Sum of Product-1 & 2)
    [146.6400,82.6656,80.1066,80.0043], //Product-6 (Sum of Prodcut-2 & 3)
    [395.0000,159.8000,150.3920,150.0157], //Product-7 (Sum of Prodcut-3 & 4)
    [213.6800,104.5472,100.1819,100.0073], //Product-8 (equal to Prodcut-5)
    [360.3200,187.2128,180.2885,180.0115], //Product-9 (Sum of Prodcut-5 & 6)
    [541.6400,242.4656,230.4986,230.0199]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,485.7143,711.1111];
```

## SETUP-II (Profile)

### **Test Instance-1: TGS2C1D1 (Test General Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_1)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 1
primary_demand = [[70.4900,70.0049,70.0000,70.0000], //Product-1
                  [30.0900,30.0009,30.0000,30.0000], //Products-2
                  [50.2500,50.0025,50.0000,50.0000], //Prodcut-3
                  [101.0000,100.0100,100.0001,100.0000]]; //Product-4

secondary_demand = [
    [100.5800,100.0058,100.0000,100.0000], //Product-5 (Sum of Product-1 & 2)
    [80.3400,80.0034,80.0000,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [151.2500,150.0125,150.0001,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [100.5800,100.0058,100.0000,100.0000], //Product-8 (equal to Prodcut-5)
    [180.9200,180.0092,180.0000,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [231.5900,230.0159,230.0000,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,355.5556,755.5556];
```

## Test Instance-2: TGS2C1D2 (Test General Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_2)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 2
primary_demand = [[77.8400,70.0784,70.0008,70.0000], //Product-1
                  [31.4400,30.0144,30.0001,30.0000], //Products-2
                  [54.0000,50.0040,50.0004,50.0000], //Prodcut-3
                  [116.0000,100.1600,100.0016,100.0000]]; //Product-4

secondary_demand = [
    [109.2800,100.0928,100.0009,100.0000], //Product-5 (Sum of Product-1 & 2)
    [85.4400,80.0544,80.0005,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [170.0000,150.2000,150.0020,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [109.2800,100.0928,100.0009,100.0000], //Product-8 (equal to Prodcut-5)
    [194.7200,180.1472,180.0015,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [255.4400,230.2544,230.0025,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,355.5556,755.5556];
```

### Test Instance-3: TGS2C1D3 (Test General Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_3)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 3
primary_demand = [[94.0100,70.2401,70.0024,70.0000], //Product-1
                  [34.4100,30.0441,30.0004,30.0000], //Products-2
                  [62.2500,50.1225,50.0012,50.0000], //Prodcut-3
                  [149.0000,100.4900,100.0049,100.0000]]; //Product-4

secondary_demand = [
    [128.4200,100.2842,100.0028,100.0000], //Product-5 (Sum of Product-1 & 2)
    [96.6600,80.1666,80.0017,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [211.2500,150.6125,150.0061,150.0001], //Product-7 (Sum of Prodcut-3 & 4)
    [128.4200,100.2842,100.0028,100.0000], //Product-8 (equal to Prodcut-5)
    [225.0800,180.4508,180.0045,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [307.9100,230.7791,230.0078,230.0001]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,355.5556,755.5556];
```



#### Test Instance-4: TGS2C1D4 (Test General Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_4)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 4
primary_demand = [[71.1025,70.048,70.0006,70.0000],           //Product-1
                  [30.2025,30.0046,30.0001,30.0000],         //Products-2
                  [50.5625,50.0127,50.0003,50.0000],         //Prodcut-3
                  [102.2500,100.0506,100.0011,100.0000]];     //Product-4

secondary_demand = [
    [101.3050,100.0294,100.0007,100.0000],           //Product-5 (Sum of Product-1 & 2)
    [80.7650,80.0172,80.0004,80.0000],               //Product-6 (Sum of Prodcut-2 & 3)
    [152.8125,150.0633,150.0014,150.0000],           //Product-7 (Sum of Prodcut-3 & 4)
    [101.3050,100.0294,100.0007,100.0000],           //Product-8 (equal to Prodcut-5)
    [182.0700,180.0466,180.0010,180.0000],           //Product-9 (Sum of Prodcut-5 & 6)
    [233.5775,230.0805,230.0018,230.0000]];          //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,355.5556,755.5556];
```

### Test Instance-5: TGS2C1D5 (Test General Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_5)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 5
primary_demand = [[87.6400,70.3969,70.0089,70.0002], //Product-1
                  [33.2400,30.0729,30.0016,30.0000], //Products-2
                  [59.0000,50.2025,50.0046,50.0001], //Prodcut-3
                  [136.0000,100.8100,100.0182,100.0004]]; //Product-4

secondary_demand = [
    [120.8800,100.4698,100.0106,100.0002], //Product-5 (Sum of Product-1 & 2)
    [92.2400,80.2754,80.0062,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [195.0000,151.0125,150.0228,150.0005], //Product-7 (Sum of Prodcut-3 & 4)
    [120.8800,100.4698,100.0106,100.0002], //Product-8 (equal to Prodcut-5)
    [213.1200,180.7452,180.0168,180.0004], //Product-9 (Sum of Prodcut-5 & 6)
    [287.2400,231.2879,230.0290,230.0007]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,355.5556,755.5556];
```

### Test Instance-6: TGS2C1D6 (Test General Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_6)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 6
primary_demand = [[124.0225,71.2155,70.0273,70.0006],      //Product-1
                  [39.9225,30.2233,30.0050,30.0001],      //Products-2
                  [77.5625,50.6202,50.0140,50.0003],      //Prodcut-3
                  [210.2500,102.4806,100.0558,100.0013]];  //Product-4

secondary_demand = [
    [163.9450,101.4388,100.0324,100.0007],                //Product-5 (Sum of Product-1 & 2)
    [117.4850,80.8434,80.0190,80.0004],                  //Product-6 (Sum of Prodcut-2 & 3)
    [287.8125,153.1008,150.0698,150.0016],                //Product-7 (Sum of Prodcut-3 & 4)
    [163.9450,101.4388,100.0324,100.0007],                //Product-8 (equal to Prodcut-5)
    [281.4300,182.2822,180.0513,180.0012],                //Product-9 (Sum of Prodcut-5 & 6)
    [405.2975,233.9442,230.0887,230.0020]];               //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,355.5556,755.5556];
```

### Test Instance-7: TGS2C1D7 (Test General Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_7)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 7
primary_demand = [[71.9600,70.0784,70.0031,70.0001], //Product-1
                  [30.3600,30.0144,30.0006,30.0000], //Products-2
                  [51.0000,50.0400,50.0016,50.0001], //Prodcut-3
                  [104.0000,100.1600,100.0064,100.0003]]; //Product-4

secondary_demand = [
    [102.3200,100.0928,100.0037,100.0001], //Product-5 (Sum of Product-1 & 2)
    [81.3600,80.0544,80.0022,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [155.0000,150.2000,150.0080,150.0003], //Product-7 (Sum of Prodcut-3 & 4)
    [102.3200,100.0928,100.0037,100.0001], //Product-8 (equal to Prodcut-5)
    [183.6800,180.1472,180.0059,180.0002], //Product-9 (Sum of Prodcut-5 & 6)
    [236.3600,230.2544,230.0102,230.0004]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,355.5556,755.5556];
```

### Test Instance-8: TGS2C1D8 (Test General Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_8)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 8
primary_demand = [[101.3600,71.2544,70.0502,70.0020], //Product-1
                  [35.7600,30.2304,30.0092,30.0004], //Products-2
                  [66.0000,50.6400,50.0256,50.0010], //Prodcut-3
                  [164.0000,102.5600,100.1024,100.0041]]; //Product-4

secondary_demand = [
    [137.1200,101.4848,100.0594,100.0024], //Product-5 (Sum of Product-1 & 2)
    [101.7600,80.8704,80.0348,80.0014], //Product-6 (Sum of Prodcut-2 & 3)
    [230.0000,153.2000,150.1280,150.0051], //Product-7 (Sum of Prodcut-3 & 4)
    [137.1200,101.4848,100.0594,100.0024], //Product-8 (equal to Prodcut-5)
    [238.8800,182.3552,180.0942,180.0038], //Product-9 (Sum of Prodcut-5 & 6)
    [331.7600,234.0704,230.1628,230.0065]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,355.5556,755.5556];
```

### Test Instance-9: TGS2C1D9 (Test General Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_9)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 9
primary_demand = [[166.0400,73.8416,70.1537,70.0061], //Product-1
                  [47.6400,30.7056,30.0282,30.0011], //Products-2
                  [99.0000,51.9600,50.0784,50.0031], //Prodcut-3
                  [296.0000,107.8400,100.3136,100.0125]]; //Product-4

secondary_demand = [
    [213.6800,104.5472,100.1819,100.0073], //Product-5 (Sum of Product-1 & 2)
    [146.6400,82.6656,80.1066,80.0043], //Product-6 (Sum of Prodcut-2 & 3)
    [395.0000,159.8000,150.3920,150.0157], //Product-7 (Sum of Prodcut-3 & 4)
    [213.6800,104.5472,100.1819,100.0073], //Product-8 (equal to Prodcut-5)
    [360.3200,187.2128,180.2885,180.0115], //Product-9 (Sum of Prodcut-5 & 6)
    [541.6400,242.4656,230.4986,230.0199]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - I (90%)
productstagecapacity = [122.2222,355.5556,755.5556];
```

### Test Instance-10: TGS2C2D1 (Test General Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_1)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 1
primary_demand = [[70.4900,70.0049,70.0000,70.0000], //Product-1
                  [30.0900,30.0009,30.0000,30.0000], //Products-2
                  [50.2500,50.0025,50.0000,50.0000], //Prodcut-3
                  [101.0000,100.0100,100.0001,100.0000]]; //Product-4

secondary_demand = [
    [100.5800,100.0058,100.0000,100.0000], //Product-5 (Sum of Product-1 & 2)
    [80.3400,80.0034,80.0000,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [151.2500,150.0125,150.0001,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [100.5800,100.0058,100.0000,100.0000], //Product-8 (equal to Prodcut-5)
    [180.9200,180.0092,180.0000,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [231.5900,230.0159,230.0000,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,457.1429,971.4286];
```

**Test Instance-11: TGS2C2D2 (Test General Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_2)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 2
primary_demand = [[77.8400,70.0784,70.0008,70.0000], //Product-1
                  [31.4400,30.0144,30.0001,30.0000], //Products-2
                  [54.0000,50.0040,50.0004,50.0000], //Prodcut-3
                  [116.0000,100.1600,100.0016,100.0000]]; //Product-4

secondary_demand = [
    [109.2800,100.0928,100.0009,100.0000], //Product-5 (Sum of Product-1 & 2)
    [85.4400,80.0544,80.0005,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [170.0000,150.2000,150.0020,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [109.2800,100.0928,100.0009,100.0000], //Product-8 (equal to Prodcut-5)
    [194.7200,180.1472,180.0015,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [255.4400,230.2544,230.0025,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,457.1429,971.4286];
```



### Test Instance-12: TGS2C2D3 (Test General Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_3)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 3
primary_demand = [[94.0100,70.2401,70.0024,70.0000], //Product-1
                  [34.4100,30.0441,30.0004,30.0000], //Products-2
                  [62.2500,50.1225,50.0012,50.0000], //Prodcut-3
                  [149.0000,100.4900,100.0049,100.0000]]; //Product-4

secondary_demand = [
    [128.4200,100.2842,100.0028,100.0000], //Product-5 (Sum of Product-1 & 2)
    [96.6600,80.1666,80.0017,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [211.2500,150.6125,150.0061,150.0001], //Product-7 (Sum of Prodcut-3 & 4)
    [128.4200,100.2842,100.0028,100.0000], //Product-8 (equal to Prodcut-5)
    [225.0800,180.4508,180.0045,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [307.9100,230.7791,230.0078,230.0001]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,457.1429,971.4286];
```

**Test Instance-13: TGS2C2D4 (Test General Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_4)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 4
primary_demand = [[71.1025,70.048,70.0006,70.0000],           //Product-1
                  [30.2025,30.0046,30.0001,30.0000],         //Products-2
                  [50.5625,50.0127,50.0003,50.0000],         //Prodcut-3
                  [102.2500,100.0506,100.0011,100.0000]];     //Product-4

secondary_demand = [
    [101.3050,100.0294,100.0007,100.0000],           //Product-5 (Sum of Product-1 & 2)
    [80.7650,80.0172,80.0004,80.0000],               //Product-6 (Sum of Prodcut-2 & 3)
    [152.8125,150.0633,150.0014,150.0000],           //Product-7 (Sum of Prodcut-3 & 4)
    [101.3050,100.0294,100.0007,100.0000],           //Product-8 (equal to Prodcut-5)
    [182.0700,180.0466,180.0010,180.0000],           //Product-9 (Sum of Prodcut-5 & 6)
    [233.5775,230.0805,230.0018,230.0000]];          //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,457.1429,971.4286];
```

#### Test Instance-14: TGS2C2D5 (Test General Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_5)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 5
primary_demand = [[87.6400,70.3969,70.0089,70.0002], //Product-1
                  [33.2400,30.0729,30.0016,30.0000], //Products-2
                  [59.0000,50.2025,50.0046,50.0001], //Prodcut-3
                  [136.0000,100.8100,100.0182,100.0004]]; //Product-4

secondary_demand = [
    [120.8800,100.4698,100.0106,100.0002], //Product-5 (Sum of Product-1 & 2)
    [92.2400,80.2754,80.0062,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [195.0000,151.0125,150.0228,150.0005], //Product-7 (Sum of Prodcut-3 & 4)
    [120.8800,100.4698,100.0106,100.0002], //Product-8 (equal to Prodcut-5)
    [213.1200,180.7452,180.0168,180.0004], //Product-9 (Sum of Prodcut-5 & 6)
    [287.2400,231.2879,230.0290,230.0007]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,457.1429,971.4286];
```

**Test Instance-15: TGS2C2D6 (Test General Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_6)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 6
primary_demand = [[124.0225,71.2155,70.0273,70.0006], //Product-1
                  [39.9225,30.2233,30.0050,30.0001], //Products-2
                  [77.5625,50.6202,50.0140,50.0003], //Prodcut-3
                  [210.2500,102.4806,100.0558,100.0013]]; //Product-4

secondary_demand = [
    [163.9450,101.4388,100.0324,100.0007], //Product-5 (Sum of Product-1 & 2)
    [117.4850,80.8434,80.0190,80.0004], //Product-6 (Sum of Prodcut-2 & 3)
    [287.8125,153.1008,150.0698,150.0016], //Product-7 (Sum of Prodcut-3 & 4)
    [163.9450,101.4388,100.0324,100.0007], //Product-8 (equal to Prodcut-5)
    [281.4300,182.2822,180.0513,180.0012], //Product-9 (Sum of Prodcut-5 & 6)
    [405.2975,233.9442,230.0887,230.0020]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,457.1429,971.4286];
```

**Test Instance-16: TGS2C2D7 (Test General Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_7)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 7
primary_demand = [[71.9600,70.0784,70.0031,70.0001], //Product-1
                  [30.3600,30.0144,30.0006,30.0000], //Products-2
                  [51.0000,50.0400,50.0016,50.0001], //Prodcut-3
                  [104.0000,100.1600,100.0064,100.0003]]; //Product-4

secondary_demand = [
    [102.3200,100.0928,100.0037,100.0001], //Product-5 (Sum of Product-1 & 2)
    [81.3600,80.0544,80.0022,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [155.0000,150.2000,150.0080,150.0003], //Product-7 (Sum of Prodcut-3 & 4)
    [102.3200,100.0928,100.0037,100.0001], //Product-8 (equal to Prodcut-5)
    [183.6800,180.1472,180.0059,180.0002], //Product-9 (Sum of Prodcut-5 & 6)
    [236.3600,230.2544,230.0102,230.0004]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,457.1429,971.4286];
```

**Test Instance-17: TGS2C2D8 (Test General Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_8)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 8
primary_demand = [[101.3600,71.2544,70.0502,70.0020], //Product-1
                  [35.7600,30.2304,30.0092,30.0004], //Products-2
                  [66.0000,50.6400,50.0256,50.0010], //Prodcut-3
                  [164.0000,102.5600,100.1024,100.0041]]; //Product-4

secondary_demand = [
    [137.1200,101.4848,100.0594,100.0024], //Product-5 (Sum of Product-1 & 2)
    [101.7600,80.8704,80.0348,80.0014], //Product-6 (Sum of Prodcut-2 & 3)
    [230.0000,153.2000,150.1280,150.0051], //Product-7 (Sum of Prodcut-3 & 4)
    [137.1200,101.4848,100.0594,100.0024], //Product-8 (equal to Prodcut-5)
    [238.8800,182.3552,180.0942,180.0038], //Product-9 (Sum of Prodcut-5 & 6)
    [331.7600,234.0704,230.1628,230.0065]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,457.1429,971.4286];
```

**Test Instance-18: TGS2C2D9 (Test General Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_9)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 9
primary_demand = [[166.0400,73.8416,70.1537,70.0061], //Product-1
                  [47.6400,30.7056,30.0282,30.0011], //Products-2
                  [99.0000,51.9600,50.0784,50.0031], //Prodcut-3
                  [296.0000,107.8400,100.3136,100.0125]]; //Product-4

secondary_demand = [
    [213.6800,104.5472,100.1819,100.0073], //Product-5 (Sum of Product-1 & 2)
    [146.6400,82.6656,80.1066,80.0043], //Product-6 (Sum of Prodcut-2 & 3)
    [395.0000,159.8000,150.3920,150.0157], //Product-7 (Sum of Prodcut-3 & 4)
    [213.6800,104.5472,100.1819,100.0073], //Product-8 (equal to Prodcut-5)
    [360.3200,187.2128,180.2885,180.0115], //Product-9 (Sum of Prodcut-5 & 6)
    [541.6400,242.4656,230.4986,230.0199]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - II (70%)
productstagecapacity = [157.1429,457.1429,971.4286];
```

### Test Instance-19: TGS2C3D1 (Test General Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_1)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 1
primary_demand = [[70.4900,70.0049,70.0000,70.0000], //Product-1
                  [30.0900,30.0009,30.0000,30.0000], //Products-2
                  [50.2500,50.0025,50.0000,50.0000], //Prodcut-3
                  [101.0000,100.0100,100.0001,100.0000]]; //Product-4

secondary_demand = [
    [100.5800,100.0058,100.0000,100.0000], //Product-5 (Sum of Product-1 & 2)
    [80.3400,80.0034,80.0000,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [151.2500,150.0125,150.0001,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [100.5800,100.0058,100.0000,100.0000], //Product-8 (equal to Prodcut-5)
    [180.9200,180.0092,180.0000,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [231.5900,230.0159,230.0000,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,640.0000,1360.0000];
```



**Test Instance-20: TGS2C3D2 (Test General Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_2)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 2
primary_demand = [[77.8400,70.0784,70.0008,70.0000], //Product-1
                  [31.4400,30.0144,30.0001,30.0000], //Products-2
                  [54.0000,50.0040,50.0004,50.0000], //Prodcut-3
                  [116.0000,100.1600,100.0016,100.0000]]; //Product-4

secondary_demand = [
    [109.2800,100.0928,100.0009,100.0000], //Product-5 (Sum of Product-1 & 2)
    [85.4400,80.0544,80.0005,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [170.0000,150.2000,150.0020,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [109.2800,100.0928,100.0009,100.0000], //Product-8 (equal to Prodcut-5)
    [194.7200,180.1472,180.0015,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [255.4400,230.2544,230.0025,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,640.0000,1360.0000];
```

**Test Instance-21: TGS2C3D3 (Test General Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_3)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 3
primary_demand = [[94.0100,70.2401,70.0024,70.0000], //Product-1
                  [34.4100,30.0441,30.0004,30.0000], //Products-2
                  [62.2500,50.1225,50.0012,50.0000], //Prodcut-3
                  [149.0000,100.4900,100.0049,100.0000]]; //Product-4

secondary_demand = [
    [128.4200,100.2842,100.0028,100.0000], //Product-5 (Sum of Product-1 & 2)
    [96.6600,80.1666,80.0017,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [211.2500,150.6125,150.0061,150.0001], //Product-7 (Sum of Prodcut-3 & 4)
    [128.4200,100.2842,100.0028,100.0000], //Product-8 (equal to Prodcut-5)
    [225.0800,180.4508,180.0045,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [307.9100,230.7791,230.0078,230.0001]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,640.0000,1360.0000];
```

### Test Instance-22: TGS2C3D4 (Test General Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_4)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 4
primary_demand = [[71.1025,70.048,70.0006,70.0000],           //Product-1
                  [30.2025,30.0046,30.0001,30.0000],         //Products-2
                  [50.5625,50.0127,50.0003,50.0000],         //Prodcut-3
                  [102.2500,100.0506,100.0011,100.0000]];     //Product-4

secondary_demand = [
    [101.3050,100.0294,100.0007,100.0000],           //Product-5 (Sum of Product-1 & 2)
    [80.7650,80.0172,80.0004,80.0000],               //Product-6 (Sum of Prodcut-2 & 3)
    [152.8125,150.0633,150.0014,150.0000],           //Product-7 (Sum of Prodcut-3 & 4)
    [101.3050,100.0294,100.0007,100.0000],           //Product-8 (equal to Prodcut-5)
    [182.0700,180.0466,180.0010,180.0000],           //Product-9 (Sum of Prodcut-5 & 6)
    [233.5775,230.0805,230.0018,230.0000]];         //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,640.0000,1360.0000];
```

**Test Instance-23: TGS2C3D5 (Test General Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_5)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 5
primary_demand = [[87.6400,70.3969,70.0089,70.0002], //Product-1
                  [33.2400,30.0729,30.0016,30.0000], //Products-2
                  [59.0000,50.2025,50.0046,50.0001], //Prodcut-3
                  [136.0000,100.8100,100.0182,100.0004]]]; //Product-4

secondary_demand = [
    [120.8800,100.4698,100.0106,100.0002], //Product-5 (Sum of Product-1 & 2)
    [92.2400,80.2754,80.0062,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [195.0000,151.0125,150.0228,150.0005], //Product-7 (Sum of Prodcut-3 & 4)
    [120.8800,100.4698,100.0106,100.0002], //Product-8 (equal to Prodcut-5)
    [213.1200,180.7452,180.0168,180.0004], //Product-9 (Sum of Prodcut-5 & 6)
    [287.2400,231.2879,230.0290,230.0007]]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,640.0000,1360.0000];
```

### Test Instance-24: TGS2C3D6 (Test General Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_6)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 6
primary_demand = [[124.0225,71.2155,70.0273,70.0006], //Product-1
                  [39.9225,30.2233,30.0050,30.0001], //Products-2
                  [77.5625,50.6202,50.0140,50.0003], //Prodcut-3
                  [210.2500,102.4806,100.0558,100.0013]]; //Product-4

secondary_demand = [
    [163.9450,101.4388,100.0324,100.0007], //Product-5 (Sum of Product-1 & 2)
    [117.4850,80.8434,80.0190,80.0004], //Product-6 (Sum of Prodcut-2 & 3)
    [287.8125,153.1008,150.0698,150.0016], //Product-7 (Sum of Prodcut-3 & 4)
    [163.9450,101.4388,100.0324,100.0007], //Product-8 (equal to Prodcut-5)
    [281.4300,182.2822,180.0513,180.0012], //Product-9 (Sum of Prodcut-5 & 6)
    [405.2975,233.9442,230.0887,230.0020]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,640.0000,1360.0000];
```

**Test Instance-25: TGS2C3D7 (Test General Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_7)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 7
primary_demand = [[71.9600,70.0784,70.0031,70.0001], //Product-1
                  [30.3600,30.0144,30.0006,30.0000], //Products-2
                  [51.0000,50.0400,50.0016,50.0001], //Prodcut-3
                  [104.0000,100.1600,100.0064,100.0003]]; //Product-4

secondary_demand = [
    [102.3200,100.0928,100.0037,100.0001], //Product-5 (Sum of Product-1 & 2)
    [81.3600,80.0544,80.0022,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [155.0000,150.2000,150.0080,150.0003], //Product-7 (Sum of Prodcut-3 & 4)
    [102.3200,100.0928,100.0037,100.0001], //Product-8 (equal to Prodcut-5)
    [183.6800,180.1472,180.0059,180.0002], //Product-9 (Sum of Prodcut-5 & 6)
    [236.3600,230.2544,230.0102,230.0004]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,640.0000,1360.0000];
```

### Test Instance-26: TGS2C3D8 (Test General Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_8)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 8
primary_demand = [[101.3600,71.2544,70.0502,70.0020], //Product-1
                  [35.7600,30.2304,30.0092,30.0004], //Products-2
                  [66.0000,50.6400,50.0256,50.0010], //Prodcut-3
                  [164.0000,102.5600,100.1024,100.0041]]; //Product-4

secondary_demand = [
    [137.1200,101.4848,100.0594,100.0024], //Product-5 (Sum of Product-1 & 2)
    [101.7600,80.8704,80.0348,80.0014], //Product-6 (Sum of Prodcut-2 & 3)
    [230.0000,153.2000,150.1280,150.0051], //Product-7 (Sum of Prodcut-3 & 4)
    [137.1200,101.4848,100.0594,100.0024], //Product-8 (equal to Prodcut-5)
    [238.8800,182.3552,180.0942,180.0038], //Product-9 (Sum of Prodcut-5 & 6)
    [331.7600,234.0704,230.1628,230.0065]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,640.0000,1360.0000];
```

**Test Instance-27: TGS2C3D9 (Test General Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_9)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 9
primary_demand = [[166.0400,73.8416,70.1537,70.0061], //Product-1
                  [47.6400,30.7056,30.0282,30.0011], //Products-2
                  [99.0000,51.9600,50.0784,50.0031], //Prodcut-3
                  [296.0000,107.8400,100.3136,100.0125]]; //Product-4

secondary_demand = [
    [213.6800,104.5472,100.1819,100.0073], //Product-5 (Sum of Product-1 & 2)
    [146.6400,82.6656,80.1066,80.0043], //Product-6 (Sum of Prodcut-2 & 3)
    [395.0000,159.8000,150.3920,150.0157], //Product-7 (Sum of Prodcut-3 & 4)
    [213.6800,104.5472,100.1819,100.0073], //Product-8 (equal to Prodcut-5)
    [360.3200,187.2128,180.2885,180.0115], //Product-9 (Sum of Prodcut-5 & 6)
    [541.6400,242.4656,230.4986,230.0199]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - III (50%)
productstagecapacity = [220.0000,640.0000,1360.0000];
```



**Test Instance-28: TGS2C4D1 (Test General Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_1)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 1
primary_demand = [[70.4900,70.0049,70.0000,70.0000], //Product-1
                  [30.0900,30.0009,30.0000,30.0000], //Products-2
                  [50.2500,50.0025,50.0000,50.0000], //Prodcut-3
                  [101.0000,100.0100,100.0001,100.0000]]; //Product-4

secondary_demand = [
    [100.5800,100.0058,100.0000,100.0000], //Product-5 (Sum of Product-1 & 2)
    [80.3400,80.0034,80.0000,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [151.2500,150.0125,150.0001,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [100.5800,100.0058,100.0000,100.0000], //Product-8 (equal to Prodcut-5)
    [180.9200,180.0092,180.0000,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [231.5900,230.0159,230.0000,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,457.1429,1360.0000];
```

**Test Instance-29: TGS2C4D2 (Test General Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_2)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 2
primary_demand = [[77.8400,70.0784,70.0008,70.0000], //Product-1
                  [31.4400,30.0144,30.0001,30.0000], //Products-2
                  [54.0000,50.0040,50.0004,50.0000], //Prodcut-3
                  [116.0000,100.1600,100.0016,100.0000]]; //Product-4

secondary_demand = [
    [109.2800,100.0928,100.0009,100.0000], //Product-5 (Sum of Product-1 & 2)
    [85.4400,80.0544,80.0005,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [170.0000,150.2000,150.0020,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [109.2800,100.0928,100.0009,100.0000], //Product-8 (equal to Prodcut-5)
    [194.7200,180.1472,180.0015,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [255.4400,230.2544,230.0025,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,457.1429,1360.0000];
```

**Test Instance-30: TGS2C4D3 (Test General Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_3)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 3
primary_demand = [[94.0100,70.2401,70.0024,70.0000], //Product-1
                  [34.4100,30.0441,30.0004,30.0000], //Products-2
                  [62.2500,50.1225,50.0012,50.0000], //Prodcut-3
                  [149.0000,100.4900,100.0049,100.0000]]; //Product-4

secondary_demand = [
    [128.4200,100.2842,100.0028,100.0000], //Product-5 (Sum of Product-1 & 2)
    [96.6600,80.1666,80.0017,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [211.2500,150.6125,150.0061,150.0001], //Product-7 (Sum of Prodcut-3 & 4)
    [128.4200,100.2842,100.0028,100.0000], //Product-8 (equal to Prodcut-5)
    [225.0800,180.4508,180.0045,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [307.9100,230.7791,230.0078,230.0001]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,457.1429,1360.0000];
```

### Test Instance-31: TGS2C4D4 (Test General Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_4)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 4
primary_demand = [[71.1025,70.048,70.0006,70.0000],           //Product-1
                  [30.2025,30.0046,30.0001,30.0000],         //Products-2
                  [50.5625,50.0127,50.0003,50.0000],         //Prodcut-3
                  [102.2500,100.0506,100.0011,100.0000]];     //Product-4

secondary_demand = [
    [101.3050,100.0294,100.0007,100.0000],           //Product-5 (Sum of Product-1 & 2)
    [80.7650,80.0172,80.0004,80.0000],               //Product-6 (Sum of Prodcut-2 & 3)
    [152.8125,150.0633,150.0014,150.0000],           //Product-7 (Sum of Prodcut-3 & 4)
    [101.3050,100.0294,100.0007,100.0000],           //Product-8 (equal to Prodcut-5)
    [182.0700,180.0466,180.0010,180.0000],           //Product-9 (Sum of Prodcut-5 & 6)
    [233.5775,230.0805,230.0018,230.0000]];          //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,457.1429,1360.0000];
```

**Test Instance-32: TGS2C4D5 (Test General Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_5)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 5
primary_demand = [[87.6400,70.3969,70.0089,70.0002], //Product-1
                  [33.2400,30.0729,30.0016,30.0000], //Products-2
                  [59.0000,50.2025,50.0046,50.0001], //Prodcut-3
                  [136.0000,100.8100,100.0182,100.0004]]]; //Product-4

secondary_demand = [
    [120.8800,100.4698,100.0106,100.0002], //Product-5 (Sum of Product-1 & 2)
    [92.2400,80.2754,80.0062,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [195.0000,151.0125,150.0228,150.0005], //Product-7 (Sum of Prodcut-3 & 4)
    [120.8800,100.4698,100.0106,100.0002], //Product-8 (equal to Prodcut-5)
    [213.1200,180.7452,180.0168,180.0004], //Product-9 (Sum of Prodcut-5 & 6)
    [287.2400,231.2879,230.0290,230.0007]]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,457.1429,1360.0000];
```

### Test Instance-33: TGS2C4D6 (Test General Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_6)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 6
primary_demand = [[124.0225,71.2155,70.0273,70.0006], //Product-1
                  [39.9225,30.2233,30.0050,30.0001], //Products-2
                  [77.5625,50.6202,50.0140,50.0003], //Prodcut-3
                  [210.2500,102.4806,100.0558,100.0013]]; //Product-4

secondary_demand = [
    [163.9450,101.4388,100.0324,100.0007], //Product-5 (Sum of Product-1 & 2)
    [117.4850,80.8434,80.0190,80.0004], //Product-6 (Sum of Prodcut-2 & 3)
    [287.8125,153.1008,150.0698,150.0016], //Product-7 (Sum of Prodcut-3 & 4)
    [163.9450,101.4388,100.0324,100.0007], //Product-8 (equal to Prodcut-5)
    [281.4300,182.2822,180.0513,180.0012], //Product-9 (Sum of Prodcut-5 & 6)
    [405.2975,233.9442,230.0887,230.0020]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,457.1429,1360.0000];
```

**Test Instance-34: TGS2C4D7 (Test General Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_7)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 7
primary_demand = [[71.9600,70.0784,70.0031,70.0001], //Product-1
                  [30.3600,30.0144,30.0006,30.0000], //Products-2
                  [51.0000,50.0400,50.0016,50.0001], //Prodcut-3
                  [104.0000,100.1600,100.0064,100.0003]]; //Product-4

secondary_demand = [
    [102.3200,100.0928,100.0037,100.0001], //Product-5 (Sum of Product-1 & 2)
    [81.3600,80.0544,80.0022,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [155.0000,150.2000,150.0080,150.0003], //Product-7 (Sum of Prodcut-3 & 4)
    [102.3200,100.0928,100.0037,100.0001], //Product-8 (equal to Prodcut-5)
    [183.6800,180.1472,180.0059,180.0002], //Product-9 (Sum of Prodcut-5 & 6)
    [236.3600,230.2544,230.0102,230.0004]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,457.1429,1360.0000];
```

### Test Instance-35: TGS2C4D8 (Test General Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_8)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 8
primary_demand = [[101.3600,71.2544,70.0502,70.0020], //Product-1
                  [35.7600,30.2304,30.0092,30.0004], //Products-2
                  [66.0000,50.6400,50.0256,50.0010], //Prodcut-3
                  [164.0000,102.5600,100.1024,100.0041]]; //Product-4

secondary_demand = [
    [137.1200,101.4848,100.0594,100.0024], //Product-5 (Sum of Product-1 & 2)
    [101.7600,80.8704,80.0348,80.0014], //Product-6 (Sum of Prodcut-2 & 3)
    [230.0000,153.2000,150.1280,150.0051], //Product-7 (Sum of Prodcut-3 & 4)
    [137.1200,101.4848,100.0594,100.0024], //Product-8 (equal to Prodcut-5)
    [238.8800,182.3552,180.0942,180.0038], //Product-9 (Sum of Prodcut-5 & 6)
    [331.7600,234.0704,230.1628,230.0065]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,457.1429,1360.0000];
```



**Test Instance-36: TGS2C4D9 (Test General Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_9)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 9
primary_demand = [[166.0400,73.8416,70.1537,70.0061], //Product-1
                  [47.6400,30.7056,30.0282,30.0011], //Products-2
                  [99.0000,51.9600,50.0784,50.0031], //Prodcut-3
                  [296.0000,107.8400,100.3136,100.0125]]; //Product-4

secondary_demand = [
    [213.6800,104.5472,100.1819,100.0073], //Product-5 (Sum of Product-1 & 2)
    [146.6400,82.6656,80.1066,80.0043], //Product-6 (Sum of Prodcut-2 & 3)
    [395.0000,159.8000,150.3920,150.0157], //Product-7 (Sum of Prodcut-3 & 4)
    [213.6800,104.5472,100.1819,100.0073], //Product-8 (equal to Prodcut-5)
    [360.3200,187.2128,180.2885,180.0115], //Product-9 (Sum of Prodcut-5 & 6)
    [541.6400,242.4656,230.4986,230.0199]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - IV (90%, 70%, 50%)
productstagecapacity = [122.2222,457.1429,1360.0000];
```

**Test Instance-37: TGS2C5D1 (Test General Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_1)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 1
primary_demand = [[70.4900,70.0049,70.0000,70.0000], //Product-1
                  [30.0900,30.0009,30.0000,30.0000], //Products-2
                  [50.2500,50.0025,50.0000,50.0000], //Prodcut-3
                  [101.0000,100.0100,100.0001,100.0000]]; //Product-4

secondary_demand = [
    [100.5800,100.0058,100.0000,100.0000], //Product-5 (Sum of Product-1 & 2)
    [80.3400,80.0034,80.0000,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [151.2500,150.0125,150.0001,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [100.5800,100.0058,100.0000,100.0000], //Product-8 (equal to Prodcut-5)
    [180.9200,180.0092,180.0000,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [231.5900,230.0159,230.0000,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,457.1429,755.5556];
```

**Test Instance-38: TGS2C5D2 (Test General Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_2)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 2
primary_demand = [[77.8400,70.0784,70.0008,70.0000], //Product-1
                  [31.4400,30.0144,30.0001,30.0000], //Products-2
                  [54.0000,50.0040,50.0004,50.0000], //Prodcut-3
                  [116.0000,100.1600,100.0016,100.0000]]; //Product-4

secondary_demand = [
    [109.2800,100.0928,100.0009,100.0000], //Product-5 (Sum of Product-1 & 2)
    [85.4400,80.0544,80.0005,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [170.0000,150.2000,150.0020,150.0000], //Product-7 (Sum of Prodcut-3 & 4)
    [109.2800,100.0928,100.0009,100.0000], //Product-8 (equal to Prodcut-5)
    [194.7200,180.1472,180.0015,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [255.4400,230.2544,230.0025,230.0000]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,457.1429,755.5556];
```

### Test Instance-39: TGS2C5D3 (Test General Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_3)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 3
primary_demand = [[94.0100,70.2401,70.0024,70.0000], //Product-1
                  [34.4100,30.0441,30.0004,30.0000], //Products-2
                  [62.2500,50.1225,50.0012,50.0000], //Prodcut-3
                  [149.0000,100.4900,100.0049,100.0000]]; //Product-4

secondary_demand = [
    [128.4200,100.2842,100.0028,100.0000], //Product-5 (Sum of Product-1 & 2)
    [96.6600,80.1666,80.0017,80.0000], //Product-6 (Sum of Prodcut-2 & 3)
    [211.2500,150.6125,150.0061,150.0001], //Product-7 (Sum of Prodcut-3 & 4)
    [128.4200,100.2842,100.0028,100.0000], //Product-8 (equal to Prodcut-5)
    [225.0800,180.4508,180.0045,180.0000], //Product-9 (Sum of Prodcut-5 & 6)
    [307.9100,230.7791,230.0078,230.0001]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,457.1429,755.5556];
```

#### Test Instance-40: TGS2C5D4 (Test General Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_4)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 4
primary_demand = [[71.1025,70.048,70.0006,70.0000],           //Product-1
                  [30.2025,30.0046,30.0001,30.0000],         //Products-2
                  [50.5625,50.0127,50.0003,50.0000],         //Prodcut-3
                  [102.2500,100.0506,100.0011,100.0000]];     //Product-4

secondary_demand = [
    [101.3050,100.0294,100.0007,100.0000],           //Product-5 (Sum of Product-1 & 2)
    [80.7650,80.0172,80.0004,80.0000],               //Product-6 (Sum of Prodcut-2 & 3)
    [152.8125,150.0633,150.0014,150.0000],           //Product-7 (Sum of Prodcut-3 & 4)
    [101.3050,100.0294,100.0007,100.0000],           //Product-8 (equal to Prodcut-5)
    [182.0700,180.0466,180.0010,180.0000],           //Product-9 (Sum of Prodcut-5 & 6)
    [233.5775,230.0805,230.0018,230.0000]];          //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,457.1429,755.5556];
```

**Test Instance-41: TGS2C5D5 (Test General Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_5)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 5
primary_demand = [[87.6400,70.3969,70.0089,70.0002], //Product-1
                  [33.2400,30.0729,30.0016,30.0000], //Products-2
                  [59.0000,50.2025,50.0046,50.0001], //Prodcut-3
                  [136.0000,100.8100,100.0182,100.0004]]]; //Product-4

secondary_demand = [
    [120.8800,100.4698,100.0106,100.0002], //Product-5 (Sum of Product-1 & 2)
    [92.2400,80.2754,80.0062,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [195.0000,151.0125,150.0228,150.0005], //Product-7 (Sum of Prodcut-3 & 4)
    [120.8800,100.4698,100.0106,100.0002], //Product-8 (equal to Prodcut-5)
    [213.1200,180.7452,180.0168,180.0004], //Product-9 (Sum of Prodcut-5 & 6)
    [287.2400,231.2879,230.0290,230.0007]]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,457.1429,755.5556];
```

**Test Instance-42: TGS2C5D6 (Test General Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_6)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 6
primary_demand = [[124.0225,71.2155,70.0273,70.0006], //Product-1
                  [39.9225,30.2233,30.0050,30.0001], //Products-2
                  [77.5625,50.6202,50.0140,50.0003], //Prodcut-3
                  [210.2500,102.4806,100.0558,100.0013]]; //Product-4

secondary_demand = [
    [163.9450,101.4388,100.0324,100.0007], //Product-5 (Sum of Product-1 & 2)
    [117.4850,80.8434,80.0190,80.0004], //Product-6 (Sum of Prodcut-2 & 3)
    [287.8125,153.1008,150.0698,150.0016], //Product-7 (Sum of Prodcut-3 & 4)
    [163.9450,101.4388,100.0324,100.0007], //Product-8 (equal to Prodcut-5)
    [281.4300,182.2822,180.0513,180.0012], //Product-9 (Sum of Prodcut-5 & 6)
    [405.2975,233.9442,230.0887,230.0020]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,457.1429,755.5556];
```

**Test Instance-43: TGS2C5D7 (Test General Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_7)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 7
primary_demand = [[71.9600,70.0784,70.0031,70.0001], //Product-1
                  [30.3600,30.0144,30.0006,30.0000], //Products-2
                  [51.0000,50.0400,50.0016,50.0001], //Prodcut-3
                  [104.0000,100.1600,100.0064,100.0003]]; //Product-4

secondary_demand = [
    [102.3200,100.0928,100.0037,100.0001], //Product-5 (Sum of Product-1 & 2)
    [81.3600,80.0544,80.0022,80.0001], //Product-6 (Sum of Prodcut-2 & 3)
    [155.0000,150.2000,150.0080,150.0003], //Product-7 (Sum of Prodcut-3 & 4)
    [102.3200,100.0928,100.0037,100.0001], //Product-8 (equal to Prodcut-5)
    [183.6800,180.1472,180.0059,180.0002], //Product-9 (Sum of Prodcut-5 & 6)
    [236.3600,230.2544,230.0102,230.0004]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,457.1429,755.5556];
```



#### Test Instance-44: TGS2C5D8 (Test General Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_8)

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 8
primary_demand = [[101.3600,71.2544,70.0502,70.0020], //Product-1
                  [35.7600,30.2304,30.0092,30.0004], //Products-2
                  [66.0000,50.6400,50.0256,50.0010], //Prodcut-3
                  [164.0000,102.5600,100.1024,100.0041]]; //Product-4

secondary_demand = [
    [137.1200,101.4848,100.0594,100.0024], //Product-5 (Sum of Product-1 & 2)
    [101.7600,80.8704,80.0348,80.0014], //Product-6 (Sum of Prodcut-2 & 3)
    [230.0000,153.2000,150.1280,150.0051], //Product-7 (Sum of Prodcut-3 & 4)
    [137.1200,101.4848,100.0594,100.0024], //Product-8 (equal to Prodcut-5)
    [238.8800,182.3552,180.0942,180.0038], //Product-9 (Sum of Prodcut-5 & 6)
    [331.7600,234.0704,230.1628,230.0065]]; //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,457.1429,755.5556];
```

**Test Instance-45: TGS2C5D9 (Test General Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_9)**

```
FP = 4;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 12;
allproductsonstage1 = {8,9,10};
allproductsonstage2 = {5,6,7};
allproductsonstage3 = {1,2,3,4};
family1stage1 = {8,9};
family2stage1 = {9,10};
family3stage1 = {10};
family1stage2 = {5};
family2stage2 = {6};
family3stage2 = {7};
family1stage3 = {1,2};
family2stage3 = {2,3};
family3stage3 = {3,4};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
microperiods4tomacroperiod = {10,11,12};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [4,7,6,3,3,3,2,1,1,1];

// Product Demand - Series# 9
primary_demand = [[166.0400,73.8416,70.1537,70.0061],      //Product-1
                  [47.6400,30.7056,30.0282,30.0011],      //Products-2
                  [99.0000,51.9600,50.0784,50.0031],      //Prodcut-3
                  [296.0000,107.8400,100.3136,100.0125]];  //Product-4

secondary_demand = [
    [213.6800,104.5472,100.1819,100.0073],                //Product-5 (Sum of Product-1 & 2)
    [146.6400,82.6656,80.1066,80.0043],                   //Product-6 (Sum of Prodcut-2 & 3)
    [395.0000,159.8000,150.3920,150.0157],                 //Product-7 (Sum of Prodcut-3 & 4)
    [213.6800,104.5472,100.1819,100.0073],                 //Product-8 (equal to Prodcut-5)
    [360.3200,187.2128,180.2885,180.0115],                 //Product-9 (Sum of Prodcut-5 & 6)
    [541.6400,242.4656,230.4986,230.0199]];               //Product-10 (Sum of Prodcut-6 & 7)

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [35,15,25,50,50,40,75,50,90,115];

// Capacity Utilization Profile - V (50%, 70%, 90%)
productstagecapacity = [220.0000,457.1429,755.5556];
```