

## Problem – B (Assembly) → DATA

**Test Instance-1:** TAS1C1D1 (Test Assembly Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_1)

### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000]];
secondary_demand = [
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

### Model-2 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100]];
secondary_demand = [
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

### Model-3 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001]];
secondary_demand = [
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001,100.0000]];
secondary_demand = [
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

## Test Instance-2: TAS1C1D2 (Test Assembly Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_2)

### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000]];
secondary_demand = [
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

### Model-2 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600]];
secondary_demand = [
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

### Model-3 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016]];
secondary_demand = [
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016,100.0000]];
secondary_demand = [
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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



### Test Instance-3: TAS1C1D3 (Test Assembly Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_3)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

#### // Product Demand - Series# 3

```
primary_demand = [[149.0000]];
secondary_demand = [
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000]];
```

#### // Setup Profile - I

```
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

#### // Capacity Utilization Profile - I (90%)

```
productstagecapacity = [122.2222,377.7778,711.1111];
```

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
```

```

allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900]];
secondary_demand = [
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### **Model-3 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};

```

```

family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049]];
secondary_demand = [
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049,100.0000]];
secondary_demand = [
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Test Instance-4: TAS1C1D4 (Test Assembly Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_4)**

##### **Model-1 Data:**

```

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

min_lotsize = 1;

```

```

production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500]];
secondary_demand = [
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4

```



```

[102.2500,100.0506,100.0011],
[102.2500,100.0506,100.0011],
[102.2500,100.0506,100.0011],
[102.2500,100.0506,100.0011]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011,100.0000]];
secondary_demand = [
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];

```

```

setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### **Test Instance-5: TAS1C1D5 (Test Assembly Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_5)**

#### **Model-1 Data:**

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

```

// Product Demand - Series# 5
primary_demand = [[136.0000]];
secondary_demand = [

```

```

    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000];

```

```

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

```

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

```

#### **Model-2 Data:**

```

FP = 1;

```



```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100]];
secondary_demand = [
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};

```

```

allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182]];
secondary_demand = [
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182,100.0004]];
secondary_demand = [
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Test Instance-6: TAS1C1D6 (Test Assembly Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_6)**

##### **Model-1 Data:**

```

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

min_lotsize = 1;

```

```

production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500]];
secondary_demand = [
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6

```

```
// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558]];
secondary_demand = [
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
```

```

                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558]]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558,100.0013]];
secondary_demand = [
                [210.2500,102.4806,100.0558,100.0013],
                [210.2500,102.4806,100.0558,100.0013],
                [210.2500,102.4806,100.0558,100.0013],
                [210.2500,102.4806,100.0558,100.0013],
                [210.2500,102.4806,100.0558,100.0013],
                [210.2500,102.4806,100.0558,100.0013],
                [210.2500,102.4806,100.0558,100.0013],
                [210.2500,102.4806,100.0558,100.0013],
                [210.2500,102.4806,100.0558,100.0013],
                [210.2500,102.4806,100.0558,100.0013]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];

```

```

setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### **Test Instance-7: TAS1C1D7 (Test Assembly Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_7)**

#### **Model-1 Data:**

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

#### **// Product Demand - Series# 7**

```

primary_demand = [[104.0000]];
secondary_demand = [
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000]];

```

#### **// Setup Profile - I**

```

setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

#### **// Capacity Utilization Profile - I (90%)**

```

productstagecapacity = [122.2222,377.7778,711.1111];

```

#### **Model-2 Data:**

```

FP = 1;

```

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600]];
secondary_demand = [
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### **Model-3 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};

```



```

family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064]];
secondary_demand = [
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

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

```

```

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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064,100.0003]];
secondary_demand = [
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-8: TAS1C1D8 (Test Assembly Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_8)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;

```

```

standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000]];
secondary_demand = [
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600]];
secondary_demand = [

```

### Model-3 Data:

```
min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,3,1,1,1,1,1,1];
```

```

[164.0000,102.5600,100.1024],
[164.0000,102.5600,100.1024]]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024,100.0041]];
secondary_demand = [
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

**Test Instance-9: TAS1C1D9 (Test Assembly Setup-Profile\_1 Capacity-Profile\_1 Demand-Series\_9)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

**// Product Demand - Series# 9**

```
primary_demand = [[296.0000]];
secondary_demand = [
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000]];
```

**// Setup Profile - I**

```
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

**// Capacity Utilization Profile - I (90%)**

```
productstagecapacity = [122.2222,377.7778,711.1111];
```

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
```

```

L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400]];
secondary_demand = [
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};

```

```

family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136]];
secondary_demand = [
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136,100.0125]];
secondary_demand = [
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125]];

// Setup Profile - I
setup_time = [10,10,15,15,10,10,5,5,5,5];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-10: TAS1C2D1 (Test Assembly Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_1)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;

```

```

BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000]];
secondary_demand = [
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

#### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100]];
secondary_demand = [
    [101.0000,100.0100],
    [101.0000,100.0100],

```

```
// Setup Profile - I
```

FP = 1;

RP = 10;

```
J = 10;
```

$L = 3;$

T = 3;

$S = 9;$

```
allproductsonstage1 = {5,6,7,8,9,10};
```

```
allproductsonstage2 = {2,3,4};
```

```
allproductsonstage3 = {1};
```

```
family1stage1 = {5,6};
```

```
family2stage1 = {7,8};
```

```
family3stage1 = {9,10};
```

```
family1stage2 = {2};
```

```
family2stage2 = {3};
```

```
family3stage2 = {4};
```

```
family1stage3 = {1};
```

```
microperiods:tomacropperiod = {1,2,3};
i: i+1 31 i: i+1 {4,5,6}
```

```
microperiods2tomacroperiod == {4,5,6};
microperiods3tomacroperiod == {7,8,9}
```

$$\text{micr.oper.100sscollmicr.oper.100} = \{7, 8, 9\},$$

```
min_lotsize = 1:
```

```
min_lotsize = 1,  
production_cost = 1.
```

```
production_cost = 1,  
production_time = 1:
```

```
production_time =
standby_cost = 1:
```

BOM = 1.

$$\text{BigM} = 10000.$$

```
bigm = 10000,  
holdingcost = [10 3 3 3 1 1 1 1 1 1]:
```

normalizing cost  $[-10, 5, 5, 5, 1, 1, 1]$

```
// Product Demand - Series# 1
```

```
primary demand = [[101.0000,100.0100,100.0001]]:
```

```
secondary_demand = [
```

 $[101.0000, 100.0100, 100.0001],$ 
$$[101.0000, 100.0100, 100.0001],$$
$$[101.0000, 100.0100, 100.0001],$$
$$[101.0000, 100.0100, 100.0001],$$
$$[101.0000, 100.0100, 100.0001],$$
$$[101.0000, 100.0100, 100.0001],$$
$$[101.0000, 100.0100, 100.0001],$$
$$[101.0000, 100.0100, 100.0001],$$

```
[101.0000,100.0100,100.0001]];
```

```

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001,100.0000]];
secondary_demand = [
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

### Test Instance-11: TAS1C2D2 (Test Assembly Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_2)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000]];
secondary_demand = [
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600]];
secondary_demand = [
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016]];
secondary_demand = [
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016,100.0000]];
secondary_demand = [
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

**Test Instance-12:** TAS1C2D3 (Test Assembly Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_3)

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```



```

// Product Demand - Series# 3
primary_demand = [[149.0000]];
secondary_demand = [
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900]];
secondary_demand = [
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],

```

[illegible]

```
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049,100.0000]];
secondary_demand = [
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
```

```
productstagecapacity = [157.1429,485.7143,914.2857];
```

**Test Instance-13: TAS1C2D4 (Test Assembly Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_4)**

**Model-1 Data:**

```
FP = 1;  
RP = 10;  
J = 10;  
L = 3;  
T = 1;  
S = 3;  
allproductsonstage1 = {5,6,7,8,9,10};  
allproductsonstage2 = {2,3,4};  
allproductsonstage3 = {1};  
family1stage1 = {5,6};  
family2stage1 = {7,8};  
family3stage1 = {9,10};  
family1stage2 = {2};  
family2stage2 = {3};  
family3stage2 = {4};  
family1stage3 = {1};  
microperiods1tomacroperiod = {1,2,3};  
  
min_lotsize = 1;  
production_cost = 1;  
production_time = 1;  
standby_cost = 1;  
BOM = 1;  
BigM = 10000;  
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

**// Product Demand - Series# 4**

```
primary_demand = [[102.2500]];  
secondary_demand = [  
    [102.2500],  
    [102.2500],  
    [102.2500],  
    [102.2500],  
    [102.2500],  
    [102.2500],  
    [102.2500],  
    [102.2500],  
    [102.2500],  
    [102.2500]];
```

**// Setup Profile - I**

```
setuptime = [10,10,15,15,10,10,5,5,5,5];  
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

**// Capacity Utilization Profile - 2 (70%)**

```
productstagecapacity = [157.1429,485.7143,914.2857];
```

**Model-2 Data:**

```
FP = 1;  
RP = 10;  
J = 10;  
L = 3;
```

```

T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506]];
secondary_demand = [
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};

```

```

family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011]];
secondary_demand = [
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011,100.0000]];
secondary_demand = [
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

**Test Instance-14:** TAS1C2D5 (Test Assembly Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_5)

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;

```

```

holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000]];
secondary_demand = [
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100]];
secondary_demand = [
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],

```



```
// Setup Profile - I
```

FP = 1;

RP = 10;

```
J = 10;
```

$L = 3;$

T = 3;

S = 9;

```
allproductsonstage1 = {5,6,7,8,9,10};
```

```
allproductsonstage2 = {2,3,4};
```

```
allproductsonstage3 = {1};
```

```
family1stage1 = {5,6};
```

```
family2stage1 = {7,8};
```

```
family3stage1 = {9,10};
```

```
family1stage2 = {2};
```

```
family2stage2 = {3};
```

```
family3stage2 = {4};
```

```
family1stage3 = {1};
```

```
microperiods1tomacroperiod = {1,2,3};
```

```
microperiods2tomacroperiod = {4,5,6};
```

```
microperiods3tomacroperiod = {7,8,9};
```

```
min_lotsize = 1;
```

```
production_cost = 1;
```

```
production_time = 1;
```

```
standby_cost = 1;
```

BOM = 1;

```
BigM = 10000;
```

```
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

```
// Product Demand - Series# 5
```

```
primary_demand = [[136.0000,100.8100,100.0182]];
```

[illegible]

```
// Setup Profile - I
```

```

setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182,100.0004]];
secondary_demand = [
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

**Test Instance-15: TAS1C2D6 (Test Assembly Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_6)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500]];
secondary_demand = [
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806]];
secondary_demand = [
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558]];
secondary_demand = [
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558,100.0013]];
secondary_demand = [
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

**Test Instance-16:** TAS1C2D7 (Test Assembly Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_7)

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7

```



```

[104.0000,100.1600],
[104.0000,100.1600],
[104.0000,100.1600]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064]];
secondary_demand = [
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```



```
// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064,100.0003]];
secondary_demand = [
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

### Test Instance-17: TAS1C2D8 (Test Assembly Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_8)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000]];
secondary_demand = [
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600]];
secondary_demand = [
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024]];
secondary_demand = [
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024,100.0041]];
secondary_demand = [
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

**Test Instance-18:** TAS1C2D9 (Test Assembly Setup-Profile\_1 Capacity-Profile\_2 Demand-Series\_9)

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

```

// Product Demand - Series# 9

```



```

                [296.0000,107.8400],
                [296.0000,107.8400],
                [296.0000,107.8400]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136]];
secondary_demand = [
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

```
// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136,100.0125]];
secondary_demand = [
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,485.7143,914.2857];
```



**Test Instance-19: TAS1C3D1 (Test Assembly Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_1)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000]];
secondary_demand = [
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100]];
secondary_demand = [
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### **Model-3 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001]];
secondary_demand = [
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001,100.0000]];
secondary_demand = [
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-20: TAS1C3D2 (Test Assembly Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_2)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2

```



```

[116.0000,100.1600],
[116.0000,100.1600],
[116.0000,100.1600]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016]];
secondary_demand = [
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016,100.0000]];
secondary_demand = [
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

### Test Instance-21: TAS1C3D3 (Test Assembly Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_3)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

#### // Product Demand - Series# 3

```
primary_demand = [[149.0000]];
secondary_demand = [
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000]];
```

#### // Setup Profile - I

```
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

#### // Capacity Utilization Profile - III (50%)

```
productstagecapacity = [220.0000,680.0000,1280.0000];
```

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
```



```

allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900]];
secondary_demand = [
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};

```

```

family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049]];
secondary_demand = [
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049,100.0000]];
secondary_demand = [
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-22: TAS1C3D4 (Test Assembly Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_4)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;

```

```

BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500]];
secondary_demand = [
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506]];
secondary_demand = [
    [102.2500,100.0506],
    [102.2500,100.0506],

```

```
// Setup Profile - I
```

FP = 1;

```
J = 10;
```

$L = 3;$

T = 3;

$S = 9;$

```
allproductsonstage1 = {5,6,7,8,9,10};
```

```
allproductsonstage2 = {2,3,4};
```

```
allproductsonstage3 = {1};
```

```
family1stage1 = {5,6};
family2stage1 = {7,8};
```

```
family2stage1 = {7,8};
family2stage1 = {0,10}
```

```
family3stage1 = {9,10};
family1stage2 = {2};
```

```
family1stage2 = {2},
family2stage2 = {3}.
```

```
family2stage2 = {5},
family3stage2 = {4}.
```

```
family3stage2 = {4},
family1stage3 = {1}.
```

family1stages = [1],  
microperiods1tomacro

microperiods2tomacroperiod = {4, 5, 6}:

```
microperiods3tomacroperiod == {7,8,9}:
```

[illegible]

```
min lotsize = 1;
```

```
production cost = 1;
```

```
production time = 1;
```

```
standby_cost = 1;
```

BOM = 1;

```
BigM = 10000;
```

```
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

```
// Product Demand - Series# 4
```

```
primary_demand = [[102.2500,100.0506,100.0011]];
```

[illegible]

```

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011,100.0000]];
secondary_demand = [
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-23: TAS1C3D5 (Test Assembly Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_5)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000]];
secondary_demand = [
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100]];
secondary_demand = [
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```



```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182]];
secondary_demand = [
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182,100.0004]];
secondary_demand = [
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-24: TAS1C3D6 (Test Assembly Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_6)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

```

// Product Demand - Series# 6

```



```

                [210.2500,102.4806],
                [210.2500,102.4806],
                [210.2500,102.4806]]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558]];
secondary_demand = [
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558,100.0013]];
secondary_demand = [
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Test Instance-25: TAS1C3D7 (Test Assembly Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_7)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000]];
secondary_demand = [
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600]];
secondary_demand = [
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064]];
secondary_demand = [
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064,100.0003]];
secondary_demand = [
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-26:** TAS1C3D8 (Test Assembly Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_8)

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

```

// Product Demand - Series# 8

```



```

[164.0000,102.5600],
[164.0000,102.5600],
[164.0000,102.5600]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024]];
secondary_demand = [
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024,100.0041]];
secondary_demand = [
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Test Instance-27: TAS1C3D9 (Test Assembly Setup-Profile\_1 Capacity-Profile\_3 Demand-Series\_9)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000]];
secondary_demand = [
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400]];
secondary_demand = [
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136]];
secondary_demand = [
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136,100.0125]];
secondary_demand = [
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-28: TAS1C4D1 (Test Assembly Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_1)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1

```





```

[101.0000,100.0100],
[101.0000,100.0100],
[101.0000,100.0100]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001]];
secondary_demand = [
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001,100.0000]];
secondary_demand = [
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Test Instance-29: TAS1C4D2 (Test Assembly Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_2)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000]];
secondary_demand = [
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600]];
secondary_demand = [
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016]];
secondary_demand = [
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016,100.0000]];
secondary_demand = [
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-30: TAS1C4D3 (Test Assembly Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_3)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

```

// Product Demand - Series# 3
primary_demand = [[149.0000]];
secondary_demand = [
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900]];
secondary_demand = [
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],

```





```

setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049,100.0000]];
secondary_demand = [
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-31: TAS1C4D4 (Test Assembly Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_4)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500]];
secondary_demand = [
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506]];
secondary_demand = [
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011]];
secondary_demand = [
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011,100.0000]];
secondary_demand = [
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-32: TAS1C4D5 (Test Assembly Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_5)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5

```



```

[136.0000,100.8100],
[136.0000,100.8100],
[136.0000,100.8100]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182]];
secondary_demand = [
[136.0000,100.8100,100.0182],
[136.0000,100.8100,100.0182],
[136.0000,100.8100,100.0182],
[136.0000,100.8100,100.0182],
[136.0000,100.8100,100.0182],
[136.0000,100.8100,100.0182],
[136.0000,100.8100,100.0182],
[136.0000,100.8100,100.0182],
[136.0000,100.8100,100.0182],
[136.0000,100.8100,100.0182]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```



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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182,100.0004]];
secondary_demand = [
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Test Instance-33: TAS1C4D6 (Test Assembly Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_6)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500]];
secondary_demand = [
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806]];
secondary_demand = [
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558]];
secondary_demand = [
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558,100.0013]];
secondary_demand = [
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-34: TAS1C4D7 (Test Assembly Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_7)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7

```



```

[104.0000,100.1600],
[104.0000,100.1600],
[104.0000,100.1600]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064]];
secondary_demand = [
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064,100.0003]];
secondary_demand = [
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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



**Test Instance-35: TAS1C4D8 (Test Assembly Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_8)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000]];
secondary_demand = [
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600]];
secondary_demand = [
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024]];
secondary_demand = [
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024,100.0041]];
secondary_demand = [
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-36:** TAS1C4D9 (Test Assembly Setup-Profile\_1 Capacity-Profile\_4 Demand-Series\_9)

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9

```



```

                [296.0000,107.8400],
                [296.0000,107.8400],
                [296.0000,107.8400]]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136]];
secondary_demand = [
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136,100.0125]];
secondary_demand = [
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

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

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000]];
secondary_demand = [
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```



```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100]];
secondary_demand = [
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001]];
secondary_demand = [
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001,100.0000]];
secondary_demand = [
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

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

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2

```

```
// Product Demand - Series# 2  
primary_demand = [[116.0000,100.1600]];  
secondary_demand = [  
    [116.0000,100.1600],  
    [116.0000,100.1600],  
    [116.0000,100.1600],  
    [116.0000,100.1600],  
    [116.0000,100.1600],  
    [116.0000,100.1600],
```

```

[116.0000,100.1600],
[116.0000,100.1600],
[116.0000,100.1600]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016]];
secondary_demand = [
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016,100.0000]];
secondary_demand = [
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

### Test Instance-39: TAS1C5D3 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_3)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

#### // Product Demand - Series# 3

```
primary_demand = [[149.0000]];
secondary_demand = [
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000]];
```

#### // Setup Profile - I

```
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

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

```
productstagecapacity = [220.0000,485.7143,711.1111];
```

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
```

```

allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900]];
secondary_demand = [
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};

```



```

family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049]];
secondary_demand = [
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049,100.0000]];
secondary_demand = [
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000]];

// Setup Profile - I
setup_time = [10,10,15,15,10,10,5,5,5,5];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-40: TAS1C5D4 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_4)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;

```

```

BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500]];
secondary_demand = [
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506]];
secondary_demand = [
    [102.2500,100.0506],
    [102.2500,100.0506],

```

```
// Setup Profile - I
```

FP = 1;

RP = 10;

```
J = 10;
```

$L = 3;$

T = 3;

S = 9;

```
allproductsonstage1 = {5,6,7,8,9,10};
```

```
allproductsonstage2 = {2,3,4};
```

```
allproductsonstage3 = {1};
```

```
family1stage1 = {5,6};
```

```
family2stage1 = {7,8};
```

```
family3stage1 = {9,10};
```

```
family1stage2 = {2};
```

```
family2stage2 = {3};
```

```
family3stage2 = {4};
```

```
family1stage3 = {1};
```

```
microperiods1tomacroperiod = {1,2,3};
```

```
microperiods2tomacroperiod = {4,5,6};
```

```
microperiods3tomacroperiod = {7,8,9};
```

```
min_lotsize = 1;
```

```
production_cost = 1;
```

```
production time = 1;
```

```
standby_cost = 1;
```

BOM = 1;

```
BigM = 10000;
```

```
holdingcost = [10,3,3,3,1,1,1,1,1,1]:
```

```
// Product Demand - Series# 4
```

```
primary demand = [[102.2500,100.0506,100.0011]];
```

[illegible]

```

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011,100.0000]];
secondary_demand = [
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Test Instance-41: TAS1C5D5 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_5)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

#### // Product Demand - Series# 5

```
primary_demand = [[136.0000]];
secondary_demand = [
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000]];
```

#### // Setup Profile - I

```
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

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

```
productstagecapacity = [220.0000,485.7143,711.1111];
```

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100]];
secondary_demand = [
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182]];
secondary_demand = [
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182,100.0004]];
secondary_demand = [
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-42:** TAS1C5D6 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_6)

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6

```

```
// Setup Profile - I
```

FP = 1;

RP = 10;

J = 10;

L = 3;

$$T = 2;$$

S = 6;

allpro

```
allproductsonstage2 = {2,3,4};
```

```
allproductsonstage3 = {1};
```

```
family1stage1 = {5,6};
```

```
family2stage1 = {7,8};
```

```
family3stage1 = {9,10};
```

```
family1stage2 = {2};
```

```
family2stage2 = {3};
```

```
family3stage2 = {4};
family1stage2 = {1};
```

```
family1stage3 = {1};
micropeniodc1+emacro
```

$$\begin{aligned} \text{micropeniods1to macropeniod} &= \{1, 2, 3\}, \\ \text{micropeniods2to macropeniod} &= \{4, 5, 6\}. \end{aligned}$$
$$\text{infix opet idusztollact opet idu} = \{4, 5, 6\},$$

```
min_lotsize = 1:
```

```
min_cost = 1,
production_cost = 1.
```

```
production_cost = 1;
```

```
standby cost = 1:
```

BOM = 1:

```
BigM = 10000;
```

```
holdingcost = [10,3,3,3,1,1,1,1,1,1]:
```

1. **Introduction**

```
// Product Demand - Series# 6
```

```
primary_demand = [[210.2500, 102.4806]]
```

```
secondary_demand = [
```

[210.2500,102.4806],

[210.2500,102.4806],

 $[210.2500, 102.4806],$ 
$$[210.2500, 102.4806],$$
 $[210.2500, 102.4806],$ 

[210.2500,102.4806],

```

                [210.2500,102.4806],
                [210.2500,102.4806],
                [210.2500,102.4806]]];
// Setup Profile - I
setuptime = [10,10,15,15,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558]];
secondary_demand = [
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558]];

// Setup Profile - I
setuptime = [10,10,15,15,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558,100.0013]];
secondary_demand = [
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Test Instance-43: TAS1C5D7 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_7)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

**// Product Demand - Series# 7**

```
primary_demand = [[104.0000]];
secondary_demand = [
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000]];
```

**// Setup Profile - I**

```
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

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

```
productstagecapacity = [220.0000,485.7143,711.1111];
```

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600]];
secondary_demand = [
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064]];
secondary_demand = [
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064,100.0003]];
secondary_demand = [
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-44: TAS1C5D8 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_8)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8

```





```

[164.0000,102.5600],
[164.0000,102.5600],
[164.0000,102.5600]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024]];
secondary_demand = [
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024]];
// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024,100.0041]];
secondary_demand = [
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Test Instance-45: TAS1C5D9 (Test Assembly Setup-Profile\_1 Capacity-Profile\_5 Demand-Series\_9)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

**// Product Demand - Series# 9**

```
primary_demand = [[296.0000]];
secondary_demand = [
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000]];
```

**// Setup Profile - I**

```
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

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

```
productstagecapacity = [220.0000,485.7143,711.1111];
```

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400]];
secondary_demand = [
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136]];
secondary_demand = [
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136,100.0125]];
secondary_demand = [
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125]];

// Setup Profile - I
setuptime = [10,10,15,15,10,10,5,5,5,5];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

## Setup Profile – II

**Test Instance-1:** TAS2C1D1 (Test Assembly Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_1)

### Model–1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

```
// Product Demand - Series# 1
primary_demand = [[101.0000]];
secondary_demand = [
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000]];
```

```
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

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

### Model–2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
```



```

T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100]];
secondary_demand = [
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};

```

```

family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001]];
secondary_demand = [
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001,100.0000]];
secondary_demand = [
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-2: TAS2C1D2 (Test Assembly Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_2)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;

```

```

standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000]];
secondary_demand = [
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600]];

```



[illegible]

```
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Test Instance-3: TAS2C1D3 (Test Assembly Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_3)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

```
// Product Demand - Series# 3
primary_demand = [[149.0000]];
secondary_demand = [
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000]];
```

```
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

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

### Model–2 Data:

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

```
min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

### // Product Demand - Series# 3

```
primary_demand = [[149.0000,100.4900]];
secondary_demand = [
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900]];
```

### // Setup Profile - II

```
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

### // Capacity Utilization Profile - I (90%)

```
productstagecapacity = [122.2222,355.5556,755.5556];
```

### Model–3 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
```



```

allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049]];
secondary_demand = [
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};

```

```

family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049,100.0000]];
secondary_demand = [
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-4: TAS2C1D4 (Test Assembly Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_4)**

#### Model-1 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 1;
S = 3;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};

```

```

microperiods1tomacroperiod = {1,2,3};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500]];
secondary_demand = [
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;

```

```

BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506]];
secondary_demand = [
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011]];
secondary_demand = [

```

```

[102.2500,100.0506,100.0011],
[102.2500,100.0506,100.0011],
[102.2500,100.0506,100.0011],
[102.2500,100.0506,100.0011],
[102.2500,100.0506,100.0011],
[102.2500,100.0506,100.0011],
[102.2500,100.0506,100.0011],
[102.2500,100.0506,100.0011],
[102.2500,100.0506,100.0011]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011,100.0000]];
secondary_demand = [
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],

```

```

[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000],
[102.2500,100.0506,100.0011,100.0000]]];

```

// Setup Profile - II

```

setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

// Capacity Utilization Profile - I (90%)

```

productstagecapacity = [122.2222,355.5556,755.5556];

```

**Test Instance-5: TAS2C1D5 (Test Assembly Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_5)**

**Model-1 Data:**

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

// Product Demand - Series# 5

```

primary_demand = [[136.0000]];
secondary_demand = [
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000]];

```

// Setup Profile - II

```

setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

### Model-2 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

```
// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100]];
secondary_demand = [
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100]];
```

```
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

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

### Model-3 Data:

```
FP = 1;
RP = 10;
J = 10;
```

```

L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182]];
secondary_demand = [
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};

```



```

family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182,100.0004]];
secondary_demand = [
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-6: TAS2C1D6 (Test Assembly Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_6)**

#### Model-1 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 1;
S = 3;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500]];
secondary_demand = [
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;

```

```

BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806]];
secondary_demand = [
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558]];
secondary_demand = [

```



```

                [210.2500,102.4806,100.0558,100.0013],
                [210.2500,102.4806,100.0558,100.0013],
                [210.2500,102.4806,100.0558,100.0013]]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-7: TAS2C1D7 (Test Assembly Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_7)**

**Model-1 Data:**

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

**// Product Demand - Series# 7**

```

primary_demand = [[104.0000]];
secondary_demand = [
                [104.0000],
                [104.0000],
                [104.0000],
                [104.0000],
                [104.0000],
                [104.0000],
                [104.0000],
                [104.0000],
                [104.0000]];

```

**// Setup Profile - II**

```

setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

**// Capacity Utilization Profile - I (90%)**

```
productstagecapacity = [122.2222,355.5556,755.5556];
```

### Model-2 Data:

```
FP = 1;  
RP = 10;  
J = 10;  
L = 3;  
T = 2;  
S = 6;  
allproductsonstage1 = {5,6,7,8,9,10};  
allproductsonstage2 = {2,3,4};  
allproductsonstage3 = {1};  
family1stage1 = {5,6};  
family2stage1 = {7,8};  
family3stage1 = {9,10};  
family1stage2 = {2};  
family2stage2 = {3};  
family3stage2 = {4};  
family1stage3 = {1};  
microperiods1tomacroperiod = {1,2,3};  
microperiods2tomacroperiod = {4,5,6};  
  
min_lotsize = 1;  
production_cost = 1;  
production_time = 1;  
standby_cost = 1;  
BOM = 1;  
BigM = 10000;  
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

### // Product Demand - Series# 7

```
primary_demand = [[104.0000,100.1600]];  
secondary_demand = [  
    [104.0000,100.1600],  
    [104.0000,100.1600],  
    [104.0000,100.1600],  
    [104.0000,100.1600],  
    [104.0000,100.1600],  
    [104.0000,100.1600],  
    [104.0000,100.1600],  
    [104.0000,100.1600],  
    [104.0000,100.1600]];
```

### // Setup Profile - II

```
setuptime = [10,10,5,5,10,10,15,15,15,15];  
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

### // Capacity Utilization Profile - I (90%)

```
productstagecapacity = [122.2222,355.5556,755.5556];
```

### Model-3 Data:

```
FP = 1;  
RP = 10;  
J = 10;  
L = 3;  
T = 3;
```

```

S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064]];
secondary_demand = [
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};

```

```

family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064,100.0003]];
secondary_demand = [
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-8: TAS2C1D8 (Test Assembly Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_8)**

#### Model-1 Data:

```

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

```



```

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000]];
secondary_demand = [
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### **Model-2 Data:**

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

```

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600]];
secondary_demand = [
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024]];
secondary_demand = [
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],

```

```
// Setup Profile - II
```

FP = 1;

```
J = 10;
```

$L = 3;$

$T = 4;$

S = 12;

```
allproductsonstage1 = {5,6,7,8,9,10};
```

```
allproductsonstage2 = {2,3,4};
```

```
allproductsonstage3 = {1};
```

```
family1stage1 = {5,6};
```

```
family2stage1 = {7,8};
```

```
family3stage1 = {9,10};
```

```
family1stage2 = {2};
```

```
family2stage2 = {3};
```

```
family3stage2 = {4};
```

```
family1stage3 = {1};
```

```
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 = [10,3,3,3,1,1,1,1,1,1];
```

```
// Product Demand - Series# 8
```

```
primary_demand = [[164.0000,102.5600,100.1024,100.0041]];
```

[illegible]

```

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-9: TAS2C1D9 (Test Assembly Setup-Profile\_2 Capacity-Profile\_1 Demand-Series\_9)**

**Model-1 Data:**

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

```

// Product Demand - Series# 9
primary_demand = [[296.0000]];
secondary_demand = [
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000]];

```

```

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

```

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

```

### Model-2 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

#### // Product Demand - Series# 9

```
primary_demand = [[296.0000,107.8400]];
secondary_demand = [
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400]];

```

#### // Setup Profile - II

```
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

#### // Capacity Utilization Profile - I (90%)

```
productstagecapacity = [122.2222,355.5556,755.5556];
```

### Model-3 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136]];
secondary_demand = [
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};

```

```

family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136,100.0125]];
secondary_demand = [
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-10: TAS2C2D1 (Test Assembly Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_1)**

#### Model-1 Data:

```

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

min_lotsize = 1;

```

```

production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000]];
secondary_demand = [
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

#### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1

```





```

[101.0000,100.0100,100.0001],
[101.0000,100.0100,100.0001],
[101.0000,100.0100,100.0001],
[101.0000,100.0100,100.0001]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001,100.0000]];
secondary_demand = [
[101.0000,100.0100,100.0001,100.0000],
[101.0000,100.0100,100.0001,100.0000],
[101.0000,100.0100,100.0001,100.0000],
[101.0000,100.0100,100.0001,100.0000],
[101.0000,100.0100,100.0001,100.0000],
[101.0000,100.0100,100.0001,100.0000],
[101.0000,100.0100,100.0001,100.0000],
[101.0000,100.0100,100.0001,100.0000],
[101.0000,100.0100,100.0001,100.0000],
[101.0000,100.0100,100.0001,100.0000]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];

```

```
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

```
// Capacity Utilization Profile - 2 (70%)
```

```
productstagecapacity = [157.1429,457.1429, 971.4286];
```

**Test Instance-11: TAS2C2D2 (Test Assembly Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_2)**

**Model-1 Data:**

```
FP = 1;
```

```
RP = 10;
```

```
J = 10;
```

```
L = 3;
```

```
T = 1;
```

```
S = 3;
```

```
allproductsonstage1 = {5,6,7,8,9,10};
```

```
allproductsonstage2 = {2,3,4};
```

```
allproductsonstage3 = {1};
```

```
family1stage1 = {5,6};
```

```
family2stage1 = {7,8};
```

```
family3stage1 = {9,10};
```

```
family1stage2 = {2};
```

```
family2stage2 = {3};
```

```
family3stage2 = {4};
```

```
family1stage3 = {1};
```

```
microperiods1tomacroperiod = {1,2,3};
```

```
min_lotsize = 1;
```

```
production_cost = 1;
```

```
production_time = 1;
```

```
standby_cost = 1;
```

```
BOM = 1;
```

```
BigM = 10000;
```

```
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

```
// Product Demand - Series# 2
```

```
primary_demand = [[116.0000]];
```

```
secondary_demand = [  
    [116.0000],  
    [116.0000],  
    [116.0000],  
    [116.0000],  
    [116.0000],  
    [116.0000],  
    [116.0000],  
    [116.0000],  
    [116.0000],  
    [116.0000]];
```

```
// Setup Profile - II
```

```
setuptime = [10,10,5,5,10,10,15,15,15,15];
```

```
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

```
// Capacity Utilization Profile - 2 (70%)
```

```
productstagecapacity = [157.1429,457.1429, 971.4286];
```

**Model-2 Data:**

```
FP = 1;
```

```
RP = 10;
```

```

J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600]];
secondary_demand = [
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};

```

```

family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016]];
secondary_demand = [
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016,100.0000]];
secondary_demand = [
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

**Test Instance-12: TAS2C2D3 (Test Assembly Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_3)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;

```

```

BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000]];
secondary_demand = [
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

#### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900]];

```





```
// Setup Profile - II
```

FP = 1;

RP = 10;

```
J = 10;
```

L = 3;

$T = 4;$

S = 12;

```
allproductsonstage1 = {5,6,7,8,9,10};
```

```
allproductsonstage2 = {2,3,4};
```

```
allproductsonstage3 = {1};
```

```
family1stage1 = {5,6};
```

```
family2stage1 = {7,8};
```

```
family3stage1 = {9,10};
```

```
family1stage2 = {2};
```

```
family2stage2 = {3};
```

```
family3stage2 = {4};
```

```
family1stage3 = {1};
```

```
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 = [10,3,3,3,1,1,1,1,1,1];
```

```
// Product Demand - Series# 3
```

```
primary_demand = [[149.0000,100.4900,100.0049,100.0000]];
```

[illegible]

```
// Setup Profile - II
```

```

setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

### **Test Instance-13: TAS2C2D4 (Test Assembly Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_4)**

#### **Model-1 Data:**

```

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

```

```

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

```

// Product Demand - Series# 4
primary_demand = [[102.2500]];
secondary_demand = [
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500]];

```

```

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

```

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

### Model-2 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506]];
secondary_demand = [
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];
```

### Model-3 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011]];
secondary_demand = [
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};

```

```

family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011,100.0000]];
secondary_demand = [
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

**Test Instance-14: TAS2C2D5 (Test Assembly Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_5)**

#### Model-1 Data:

```

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

min_lotsize = 1;

```

```

production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000]];
secondary_demand = [
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

#### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5

```



```

[136.0000,100.8100,100.0182],
[136.0000,100.8100,100.0182],
[136.0000,100.8100,100.0182],
[136.0000,100.8100,100.0182]]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182,100.0004]];
secondary_demand = [
[136.0000,100.8100,100.0182,100.0004],
[136.0000,100.8100,100.0182,100.0004],
[136.0000,100.8100,100.0182,100.0004],
[136.0000,100.8100,100.0182,100.0004],
[136.0000,100.8100,100.0182,100.0004],
[136.0000,100.8100,100.0182,100.0004],
[136.0000,100.8100,100.0182,100.0004],
[136.0000,100.8100,100.0182,100.0004],
[136.0000,100.8100,100.0182,100.0004],
[136.0000,100.8100,100.0182,100.0004]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];

```



```
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

```
// Capacity Utilization Profile - 2 (70%)
```

```
productstagecapacity = [157.1429,457.1429, 971.4286];
```

**Test Instance-15: TAS2C2D6 (Test Assembly Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_6)**

#### Model-1 Data:

```
FP = 1;
```

```
RP = 10;
```

```
J = 10;
```

```
L = 3;
```

```
T = 1;
```

```
S = 3;
```

```
allproductsonstage1 = {5,6,7,8,9,10};
```

```
allproductsonstage2 = {2,3,4};
```

```
allproductsonstage3 = {1};
```

```
family1stage1 = {5,6};
```

```
family2stage1 = {7,8};
```

```
family3stage1 = {9,10};
```

```
family1stage2 = {2};
```

```
family2stage2 = {3};
```

```
family3stage2 = {4};
```

```
family1stage3 = {1};
```

```
microperiods1tomacroperiod = {1,2,3};
```

```
min_lotsize = 1;
```

```
production_cost = 1;
```

```
production_time = 1;
```

```
standby_cost = 1;
```

```
BOM = 1;
```

```
BigM = 10000;
```

```
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

```
// Product Demand - Series# 6
```

```
primary_demand = [[210.2500]];
```

```
secondary_demand = [  
    [210.2500],  
    [210.2500],  
    [210.2500],  
    [210.2500],  
    [210.2500],  
    [210.2500],  
    [210.2500],  
    [210.2500],  
    [210.2500],  
    [210.2500]];
```

```
// Setup Profile - II
```

```
setuptime = [10,10,5,5,10,10,15,15,15,15];
```

```
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

```
// Capacity Utilization Profile - 2 (70%)
```

```
productstagecapacity = [157.1429,457.1429, 971.4286];
```

#### Model-2 Data:

```
FP = 1;
```

```
RP = 10;
```

```

J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806]];
secondary_demand = [
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};

```

```

family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558]];
secondary_demand = [
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558,100.0013]];
secondary_demand = [
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

**Test Instance-16: TAS2C2D7 (Test Assembly Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_7)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;

```

```

BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000]];
secondary_demand = [
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600]];
secondary_demand = [
    [104.0000,100.1600],

```

```
// Setup Profile - II
```

```
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

```
// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429, 457.1429, 971.4286];
```

### Model-3 Data:

```
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};
```

```
min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,3,1,1,1,1,1,1];
```

[illegible]

```

[104.0000,100.1600,100.0064]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064,100.0003]];
secondary_demand = [
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)

```

```
productstagecapacity = [157.1429,457.1429, 971.4286];
```

**Test Instance-17:** TAS2C2D8 (Test Assembly Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_8)

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

```
// Product Demand - Series# 8
```

```
primary_demand = [[164.0000]];
secondary_demand = [
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000]];
```

```
// Setup Profile - II
```

```
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

```
// Capacity Utilization Profile - 2 (70%)
```

```
productstagecapacity = [157.1429,457.1429, 971.4286];
```

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
```



```

S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600]];
secondary_demand = [
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};

```

```

family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024]];
secondary_demand = [
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024,100.0041]];
secondary_demand = [
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

**Test Instance-18:** TAS2C2D9 (Test Assembly Setup-Profile\_2 Capacity-Profile\_2 Demand-Series\_9)

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

```

// Product Demand - Series# 9
primary_demand = [[296.0000]];
secondary_demand = [
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400]];
secondary_demand = [
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],

```

```

                [296.0000,107.8400],
                [296.0000,107.8400],
                [296.0000,107.8400],
                [296.0000,107.8400],
                [296.0000,107.8400]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

// Capacity Utilization Profile - 2 (70%)
productstagecapacity = [157.1429,457.1429, 971.4286];

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136]];
secondary_demand = [
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];

```

```
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

```
// Capacity Utilization Profile - 2 (70%)
```

```
productstagecapacity = [157.1429,457.1429, 971.4286];
```

#### Model-4 Data:

```
FP = 1;
```

```
RP = 10;
```

```
J = 10;
```

```
L = 3;
```

```
T = 4;
```

```
S = 12;
```

```
allproductsonstage1 = {5,6,7,8,9,10};
```

```
allproductsonstage2 = {2,3,4};
```

```
allproductsonstage3 = {1};
```

```
family1stage1 = {5,6};
```

```
family2stage1 = {7,8};
```

```
family3stage1 = {9,10};
```

```
family1stage2 = {2};
```

```
family2stage2 = {3};
```

```
family3stage2 = {4};
```

```
family1stage3 = {1};
```

```
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 = [10,3,3,3,1,1,1,1,1,1];
```

```
// Product Demand - Series# 9
```

```
primary_demand = [[296.0000,107.8400,100.3136,100.0125]];
```

```
secondary_demand = [  
    [296.0000,107.8400,100.3136,100.0125],  
    [296.0000,107.8400,100.3136,100.0125],  
    [296.0000,107.8400,100.3136,100.0125],  
    [296.0000,107.8400,100.3136,100.0125],  
    [296.0000,107.8400,100.3136,100.0125],  
    [296.0000,107.8400,100.3136,100.0125],  
    [296.0000,107.8400,100.3136,100.0125],  
    [296.0000,107.8400,100.3136,100.0125],  
    [296.0000,107.8400,100.3136,100.0125],  
    [296.0000,107.8400,100.3136,100.0125]];
```

```
// Setup Profile - II
```

```
setuptime = [10,10,5,5,10,10,15,15,15,15];
```

```
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

```
// Capacity Utilization Profile - 2 (70%)
```

```
productstagecapacity = [157.1429,457.1429, 971.4286];
```

**Test Instance-19: TAS2C3D1 (Test Assembly Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_1)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000]];
secondary_demand = [
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100]];
secondary_demand = [
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```



```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001]];
secondary_demand = [
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001,100.0000]];
secondary_demand = [
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-20: TAS2C3D2 (Test Assembly Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_2)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2

```



```

[116.0000,100.1600],
[116.0000,100.1600],
[116.0000,100.1600]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016]];
secondary_demand = [
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016],
[116.0000,100.1600,100.0016]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016,100.0000]];
secondary_demand = [
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

### Test Instance-21: TAS2C3D3 (Test Assembly Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_3)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

#### // Product Demand - Series# 3

```
primary_demand = [[149.0000]];
secondary_demand = [
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000]];
```

#### // Setup Profile - II

```
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

#### // Capacity Utilization Profile - III (50%)

```
productstagecapacity = [220.0000,640.0000,1360.0000];
```

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
```

```

allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900]];
secondary_demand = [
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};

```

```

family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049]];
secondary_demand = [
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049,100.0000]];
secondary_demand = [
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-22: TAS2C3D4 (Test Assembly Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_4)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;

```

```

BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500]];
secondary_demand = [
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506]];
secondary_demand = [
    [102.2500,100.0506],
    [102.2500,100.0506],

```

```
// Setup Profile - II
```

FP = 1;

```
J = 10;
```

$L = 3;$

T = 3;

$S = 9;$

```
allproductsonstage1 = {5,6,7,8,9,10};
```

```
allproductsonstage2 = {2,3,4};
```

```
allproductsonstage3 = {1};
```

```
family1stage1 = {5,6};
```

```
family2stage1 = {7,8};
```

```
family3stage1 = {9,10};
```

```
family1stage2 = {2};
```

```
family2stage2 = {3};
```

```
family3stage2 = {4};
```

```
family1stage3 = {1};
```

```
microperiods:tomacropperiod = {1,2,3};
i: i+1,3 i: i+1,5,6;
```

```
microperiods2tomacroperiod == {4,5,6};
microperiods3tomacroperiod == {7,8,9}
```

$$\text{micr.oper.10u55collmicr.oper.10u} = \{7, 8, 9\},$$

```
min_lotsize = 1;
```

```
production_cost = 1;
```

```
production_time = 1;
```

```
standby_cost = 1;
```

BOM = 1;

```
BigM = 10000;
```

```
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

```
// Product Demand - Series# 4
```

```
primary_demand = [[102.2500,100.0506,100.0011]];
```

[illegible]

```

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011,100.0000]];
secondary_demand = [
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Test Instance-23: TAS2C3D5 (Test Assembly Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_5)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000]];
secondary_demand = [
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100]];
secondary_demand = [
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182]];
secondary_demand = [
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182,100.0004]];
secondary_demand = [
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-24: TAS2C3D6 (Test Assembly Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_6)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6

```



```
// Product Demand - Series# 6  
primary_demand = [[210.2500,102.4806]];  
secondary_demand = [  
    [210.2500,102.4806],  
    [210.2500,102.4806],  
    [210.2500,102.4806],  
    [210.2500,102.4806],  
    [210.2500,102.4806],  
    [210.2500,102.4806],
```

```

                [210.2500,102.4806],
                [210.2500,102.4806],
                [210.2500,102.4806]]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558]];
secondary_demand = [
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558,100.0013]];
secondary_demand = [
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Test Instance-25: TAS2C3D7 (Test Assembly Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_7)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000]];
secondary_demand = [
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600]];
secondary_demand = [
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064]];
secondary_demand = [
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064,100.0003]];
secondary_demand = [
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-26:** TAS2C3D8 (Test Assembly Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_8)

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

```

// Product Demand - Series# 8

```





```

[164.0000,102.5600],
[164.0000,102.5600],
[164.0000,102.5600]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024]];
secondary_demand = [
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024,100.0041]];
secondary_demand = [
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

### Test Instance-27: TAS2C3D9 (Test Assembly Setup-Profile\_2 Capacity-Profile\_3 Demand-Series\_9)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000]];
secondary_demand = [
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400]];
secondary_demand = [
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136]];
secondary_demand = [
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136,100.0125]];
secondary_demand = [
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-28: TAS2C4D1 (Test Assembly Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_1)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1

```



```

[101.0000,100.0100],
[101.0000,100.0100],
[101.0000,100.0100]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001]];
secondary_demand = [
[101.0000,100.0100,100.0001],
[101.0000,100.0100,100.0001],
[101.0000,100.0100,100.0001],
[101.0000,100.0100,100.0001],
[101.0000,100.0100,100.0001],
[101.0000,100.0100,100.0001],
[101.0000,100.0100,100.0001],
[101.0000,100.0100,100.0001],
[101.0000,100.0100,100.0001],
[101.0000,100.0100,100.0001]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```



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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001,100.0000]];
secondary_demand = [
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

### Test Instance-29: TAS2C4D2 (Test Assembly Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_2)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000]];
secondary_demand = [
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000],
    [116.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600]];
secondary_demand = [
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600],
    [116.0000,100.1600]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016]];
secondary_demand = [
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016,100.0000]];
secondary_demand = [
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-30: TAS2C4D3 (Test Assembly Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_3)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

```

// Product Demand - Series# 3
primary_demand = [[149.0000]];
secondary_demand = [
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900]];
secondary_demand = [
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],

```

```
// Setup Profile - II
```

FP = 1;

```
J = 10;
```

$L = 3;$

$T = 3;$

S = 9;

```
allproductsonstage1 = {5,6,7,8,9,10};
```

```
allproductsonstage2 = {2,3,4};
```

```
allproductsonstage3 = {1};
```

```
family1stage1 = {5,6};
```

```
family2stage1 = {7,8};
```

```
family3stage1 = {9,10};
```

```
family1stage2 = {2};
```

```
family2stage2 = {3};
```

```
family3stage2 = {4};
```

```
family1stage3 = {1};
```

```
microperiods1tomacroperiod = {1,2,3};
```

```
microperiods2tomacroperiod = {4,5,6};
```

```
microperiods3tomacroperiod = {7,8,9};
```

```
min_lotsize = 1;
```

```
production_cost = 1;
```

```
production_time = 1;
```

```
standby_cost = 1;
```

BOM = 1;

```
BigM = 10000;
```

```
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

```
// Product Demand - Series# 3
```

```
primary_demand = [[149.0000,100.4900,100.0049]];
```

$$\text{secondary demand} = [$$
 $[149.0000, 100.4900, 100.0049],$ 

[149.0000,100.4900,100.0049],

[149.0000,100.4900,100.0049],

[149.0000,100.4900,100.0049],

[149.0000,100.4900,100.0049],

```
[149.0000,100.4900,100.0049],
```

[149.0000,100.4900,100.0049],

[149.0000,100.4900,100.0049].

```
[149:0000,100:4900,100:0049],
[149 0000 100 4900 100 0049]]:
```

```
// Setup Profile - IT
```

```
// Setup Profile [14]
```

```

setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049,100.0000]];
secondary_demand = [
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```



### Test Instance-31: TAS2C4D4 (Test Assembly Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_4)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500]];
secondary_demand = [
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506]];
secondary_demand = [
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506],
    [102.2500,100.0506]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011]];
secondary_demand = [
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011],
    [102.2500,100.0506,100.0011]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011,100.0000]];
secondary_demand = [
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-32: TAS2C4D5 (Test Assembly Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_5)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5

```

```
// Product Demand - Series# 5  
primary_demand = [[136.0000,100.8100]];  
secondary_demand = [  
    [136.0000,100.8100],  
    [136.0000,100.8100],  
    [136.0000,100.8100],  
    [136.0000,100.8100],  
    [136.0000,100.8100],  
    [136.0000,100.8100],
```

```

[136.0000,100.8100],
[136.0000,100.8100],
[136.0000,100.8100]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182]];
secondary_demand = [
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182,100.0004]];
secondary_demand = [
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

### Test Instance-33: TAS2C4D6 (Test Assembly Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_6)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500]];
secondary_demand = [
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500],
    [210.2500]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```



```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806]];
secondary_demand = [
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806],
    [210.2500,102.4806]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558]];
secondary_demand = [
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558],
    [210.2500,102.4806,100.0558]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558,100.0013]];
secondary_demand = [
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-34:** TAS2C4D7 (Test Assembly Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_7)

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7

```



```

[104.0000,100.1600],
[104.0000,100.1600],
[104.0000,100.1600]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064]];
secondary_demand = [
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064],
[104.0000,100.1600,100.0064]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064,100.0003]];
secondary_demand = [
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Test Instance-35: TAS2C4D8 (Test Assembly Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_8)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000]];
secondary_demand = [
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000],
    [164.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600]];
secondary_demand = [
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600],
    [164.0000,102.5600]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```



```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024]];
secondary_demand = [
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024,100.0041]];
secondary_demand = [
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-36:** TAS2C4D9 (Test Assembly Setup-Profile\_2 Capacity-Profile\_4 Demand-Series\_9)

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9

```



```

                [296.0000,107.8400],
                [296.0000,107.8400],
                [296.0000,107.8400]]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136]];
secondary_demand = [
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136],
                [296.0000,107.8400,100.3136]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136,100.0125]];
secondary_demand = [
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

### Test Instance-37: TAS2C5D1 (Test Assembly Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_1)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000]];
secondary_demand = [
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000],
    [101.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100]];
secondary_demand = [
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100],
    [101.0000,100.0100]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001]];
secondary_demand = [
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001],
    [101.0000,100.0100,100.0001]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 1
primary_demand = [[101.0000,100.0100,100.0001,100.0000]];
secondary_demand = [
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000],
    [101.0000,100.0100,100.0001,100.0000]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-38: TAS2C5D2 (Test Assembly Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_2)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2

```

```
// Product Demand - Series# 2  
primary_demand = [[116.0000,100.1600]];  
secondary_demand = [  
    [116.0000,100.1600],  
    [116.0000,100.1600],  
    [116.0000,100.1600],  
    [116.0000,100.1600],  
    [116.0000,100.1600],  
    [116.0000,100.1600],
```

```

[116.0000,100.1600],
[116.0000,100.1600],
[116.0000,100.1600]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016]];
secondary_demand = [
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016],
    [116.0000,100.1600,100.0016]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 2
primary_demand = [[116.0000,100.1600,100.0016,100.0000]];
secondary_demand = [
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000],
    [116.0000,100.1600,100.0016,100.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

### Test Instance-39: TAS2C5D3 (Test Assembly Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_3)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

#### // Product Demand - Series# 3

```
primary_demand = [[149.0000]];
secondary_demand = [
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000],
    [149.0000]];
```

#### // Setup Profile - II

```
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

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

```
productstagecapacity = [220.0000,457.1429,755.5556];
```

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
```

```

allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

```

```

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

```

// Product Demand - Series# 3

```

primary_demand = [[149.0000,100.4900]];
secondary_demand = [

```

```

    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900],
    [149.0000,100.4900]];

```

// Setup Profile - II

```

setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

```

productstagecapacity = [220.0000,457.1429,755.5556];

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};

```

```

family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049]];
secondary_demand = [
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049],
    [149.0000,100.4900,100.0049]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 3
primary_demand = [[149.0000,100.4900,100.0049,100.0000]];
secondary_demand = [
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000],
    [149.0000,100.4900,100.0049,100.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-40: TAS2C5D4 (Test Assembly Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_4)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;

```



```

BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500]];
secondary_demand = [
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500],
    [102.2500]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-2 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506]];
secondary_demand = [
    [102.2500,100.0506],
    [102.2500,100.0506],

```



```

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### Model-4 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 4
primary_demand = [[102.2500,100.0506,100.0011,100.0000]];
secondary_demand = [
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000],
    [102.2500,100.0506,100.0011,100.0000]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Test Instance-41: TAS2C5D5 (Test Assembly Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_5)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

#### // Product Demand - Series# 5

```
primary_demand = [[136.0000]];
secondary_demand = [
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000],
    [136.0000]];
```

#### // Setup Profile - II

```
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

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

```
productstagecapacity = [220.0000,457.1429,755.5556];
```

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100]];
secondary_demand = [
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100],
    [136.0000,100.8100]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182]];
secondary_demand = [
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182],
    [136.0000,100.8100,100.0182]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 5
primary_demand = [[136.0000,100.8100,100.0182,100.0004]];
secondary_demand = [
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004],
    [136.0000,100.8100,100.0182,100.0004]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-42: TAS2C5D6 (Test Assembly Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_6)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6

```





```

                [210.2500,102.4806],
                [210.2500,102.4806],
                [210.2500,102.4806]]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558]];
secondary_demand = [
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558],
                [210.2500,102.4806,100.0558]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```

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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 6
primary_demand = [[210.2500,102.4806,100.0558,100.0013]];
secondary_demand = [
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013],
    [210.2500,102.4806,100.0558,100.0013]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

**Test Instance-43: TAS2C5D7 (Test Assembly Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_7)**

**Model-1 Data:**

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

**// Product Demand - Series# 7**

```
primary_demand = [[104.0000]];
secondary_demand = [
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000],
    [104.0000]];
```

**// Setup Profile - II**

```
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

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

```
productstagecapacity = [220.0000,457.1429,755.5556];
```

**Model-2 Data:**

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600]];
secondary_demand = [
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600],
    [104.0000,100.1600]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064]];
secondary_demand = [
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064],
    [104.0000,100.1600,100.0064]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 7
primary_demand = [[104.0000,100.1600,100.0064,100.0003]];
secondary_demand = [
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003],
    [104.0000,100.1600,100.0064,100.0003]];

// Setup Profile - II
setup_time = [10,10,5,5,10,10,15,15,15,15];
setup_cost = [50,50,50,50,50,50,50,50,50,50];

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

```

**Test Instance-44: TAS2C5D8 (Test Assembly Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_8)**

#### Model-1 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8

```



```

[164.0000,102.5600],
[164.0000,102.5600],
[164.0000,102.5600]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024]];
secondary_demand = [
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024],
    [164.0000,102.5600,100.1024]];
// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

```



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

#### Model-4 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 8
primary_demand = [[164.0000,102.5600,100.1024,100.0041]];
secondary_demand = [
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041],
    [164.0000,102.5600,100.1024,100.0041]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

### Test Instance-45: TAS2C5D9 (Test Assembly Setup-Profile\_2 Capacity-Profile\_5 Demand-Series\_9)

#### Model-1 Data:

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

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];
```

#### // Product Demand - Series# 9

```
primary_demand = [[296.0000]];
secondary_demand = [
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000],
    [296.0000]];
```

#### // Setup Profile - II

```
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];
```

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

```
productstagecapacity = [220.0000,457.1429,755.5556];
```

#### Model-2 Data:

```
FP = 1;
RP = 10;
J = 10;
L = 3;
T = 2;
S = 6;
allproductsonstage1 = {5,6,7,8,9,10};
```

```

allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400]];
secondary_demand = [
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400],
    [296.0000,107.8400]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

### Model-3 Data:

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 3;
S = 9;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};

```

```

family1stage3 = {1};
microperiods1tomacroperiod = {1,2,3};
microperiods2tomacroperiod = {4,5,6};
microperiods3tomacroperiod = {7,8,9};

min_lotsize = 1;
production_cost = 1;
production_time = 1;
standby_cost = 1;
BOM = 1;
BigM = 10000;
holdingcost = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136]];
secondary_demand = [
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136],
    [296.0000,107.8400,100.3136]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```

#### **Model-4 Data:**

```

FP = 1;
RP = 10;
J = 10;
L = 3;
T = 4;
S = 12;
allproductsonstage1 = {5,6,7,8,9,10};
allproductsonstage2 = {2,3,4};
allproductsonstage3 = {1};
family1stage1 = {5,6};
family2stage1 = {7,8};
family3stage1 = {9,10};
family1stage2 = {2};
family2stage2 = {3};
family3stage2 = {4};
family1stage3 = {1};
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 = [10,3,3,3,1,1,1,1,1,1];

// Product Demand - Series# 9
primary_demand = [[296.0000,107.8400,100.3136,100.0125]];
secondary_demand = [
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125],
    [296.0000,107.8400,100.3136,100.0125]];

// Setup Profile - II
setuptime = [10,10,5,5,10,10,15,15,15,15];
setupcost = [50,50,50,50,50,50,50,50,50,50];

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

```