# Making Examination Schedule

# Mathematical model formulation

# SETS AND INDICES

# *Sets Description Indices*

***s\_Item*** *Set of items*

***s\_Vendor*** *Set of vendors*

***s\_Slab*** *Set of discount slab ({0, 1, 2})*

**PARAMETERS**

***Parameter Description***

*Price of unit item ‘i' for vendor ‘v’*

*Quantity of item ‘i' provided by vendor ‘v’*

*Demand of item ‘i'*

*Penalty cost for unit unsatisfied demand of item ‘i'*

*A vendor provides a discount of ‘x1’and ‘x2’ % on the total spend if the total spent allocated to the vendor is greater than or equal to ‘S1’ and ‘S2’ respectively.*

*A vendor provides a discount of ‘y1’and ‘y2’ % on the total spend if the total quantity allocated to the vendor is greater than or equal to ‘Q1’ and ‘Q2’ respectively.*

***M*** *A sufficiently large positive number*

# DECISION VARIABLES

***Decision variables Description Type Range***

*Quantity of order for item Continuous [0, )*

*‘i' assigned to vendor ‘v’*

*Quantity of unsatisfied Continuous [0, )*

*demand of item ‘i’*

*Total spend allocated to Continuous [0, )*

*vendor ‘v’*

*Total quantity allocated to Continuous [0, )*

*vendor ‘v’*

*Total spend allocated to Continuous [0, )*

*vendor ‘v’ after discount*

*Spend discount availed Continuous [0, 100]*

*in % from vendor ‘v’*

*Shipment discount availed Continuous [0, 100]*

*in % from vendor ‘v’*

*Is equal to 1 if the Buyer is Binary {0, 1}*

*in slab ‘s’ for vendor ‘v’*

*for spent discount*

*slab 0 : [0, S1); slab 1 : [S1, S2); slab 2 : [S2, )*

*Is equal to 1 if the Buyer is Binary {0, 1}*

*in slab ‘s’ for vendor ‘v’*

*for shipment discount*

*slab 0 : [0, Q1); slab 1 : [Q1, Q2); slab 2 : [Q2, )*

**OBJECTIVE FUNCTION**

**Minimize the total allocation cost and also maximizing fulfillment by minimizing penalty cost.**

**Minimize** ***OBJ.***

**CONSTRAINTS**

1. **The order for an item to a vendor should not exceed vendor’s capacity for that item**
2. **The total allocation should not exceed the demand of that item. There is a possibility that some demand of items can remain unfulfilled so adding a penalty as soft constraint.**
3. **Total spend allocated to vendor ‘v’.**
4. **Total quantity allocated to vendor ‘v’.**
5. **Spend discount availed in % from vendor ‘v’.**

*The below constraints are applicable for all* .

//*The total spent to vendor ‘v’ must be in any of the slab*

// *When total spent to vendor ‘v’ in 1st slab*

// *When total spent to vendor ‘v’ in 2nd slab*

// *When total spent to vendor ‘v’ in 2nd slab*

// *When total spent to vendor ‘v’ in 3rd slab*

// *Spend discount availed in % from vendor ‘v’*

1. **Shipment discount availed in % from vendor ‘v’.**

*The below constraints are applicable for all* .

//*The total quantity allocated to vendor ‘v’ must be in any of the slab*

// *When total quantity for vendor ‘v’ in 1st slab*

// *When total quantity for vendor ‘v’ in 2nd slab*

// *When total quantity for vendor ‘v’ in 2nd slab*

// *When total quantity for vendor ‘v’ in 3rd slab*

// *Shipment discount availed in % from vendor ‘v’*

1. **Total spend allocated to vendor ‘v’ after spent discount and shipment discount.**