Engineering Management

Transportation Model

AIM OF TRANSPORTATION MODEL

- To find out the **optimum transportation schedule** keeping in mind the cost of transportation to be **minimized**.

THE MODEL REQUIRES FEW DATA ELEMENTS

- ☑ **Origin of Supply**
- ☑ **Destination**
- ☑ **Unit Cost of Shipping (Per Unit Cost)**

WHAT IS TRANSPORTATION MODEL?

Transportation Model is a special case of LPP (Linear Programming Problem) in which the main objective is **to transport a product from various sources various destinations at total minimum costs**.

WHAT IS TRANSPORTATION MODEL?

- In transportation models, the **sources** and **destinations** at each source and destination are also known.
- It is desired to find the best arrangement for transportation such that the transportation cost is minimum.

WHAT IS TRANSPORTATION MODEL?

As it is a model, we have to make some assumptions.

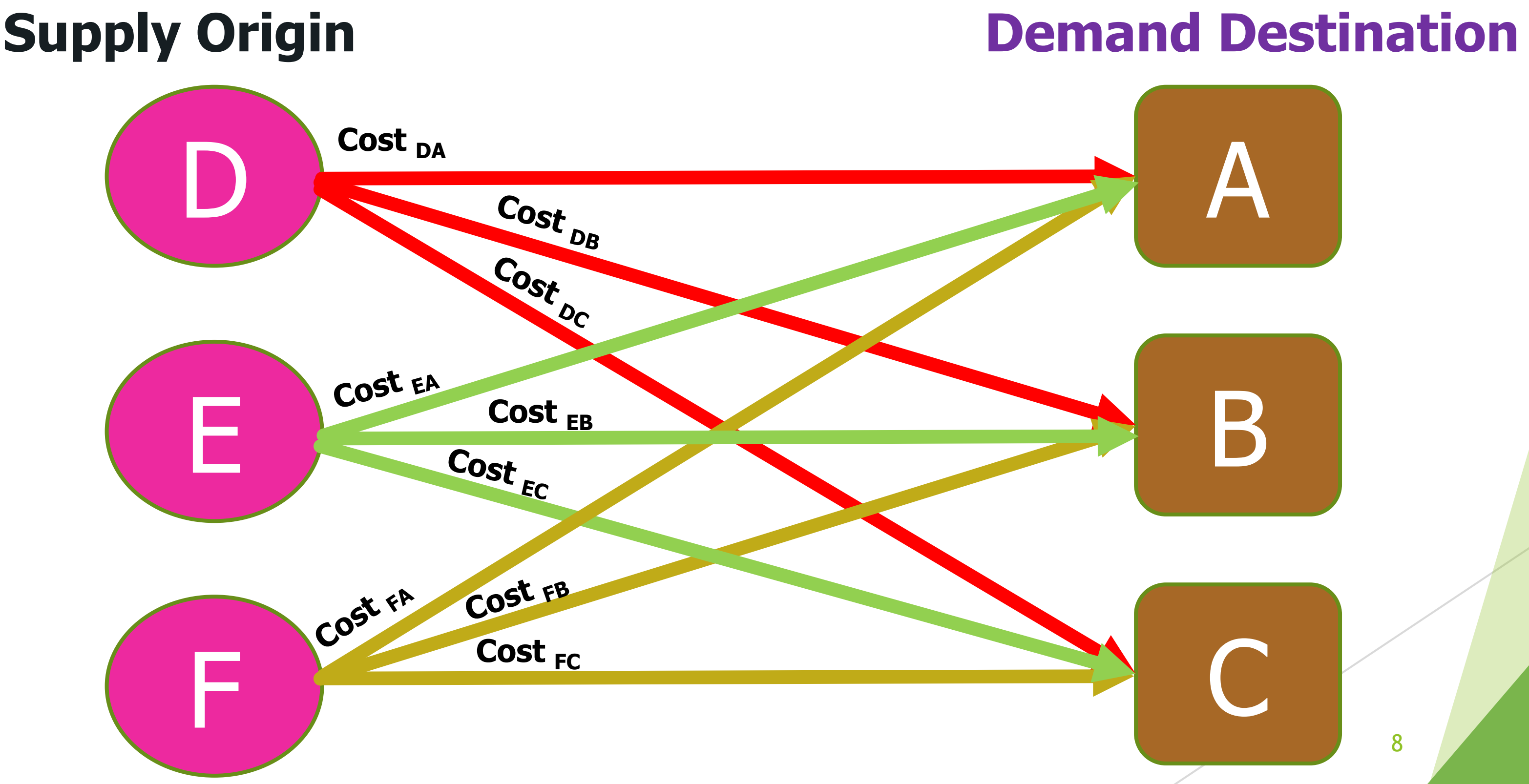
These assumptions are:

- Items are homogeneous
- Shipping costs per unit are the same, no matter the quantity delivered
- Only one route is choosen between the origin and destination

WHAT IS TRANSPORTATION MODEL?

- For example, consider three companies (Company 1, Company 2, and Company 3) which produces mobile phones and are located in different regions.
- Similarly, consider three cities (namely A, B & C) where the mobile phones are transported.
- The companies where mobile phones are available are known as **sources** and the cities where mobile phones are transported are called **destinations**.

WHAT IS TRANSPORTATION MODEL?



WHAT IS TRANSPORTATION MODEL?

- Let, Company 1 produces a1 units,
  Company 2 produces a2 units, and
  Company 3 produces a3 units,
- Let, demand in City A is b1 units,
  demand in City B is b2 units, and
  demand in City C is c3 units

WHAT IS TRANSPORTATION MODEL?

The cost of transportation from each source to destination is given in table.

DESTINATIONS					
SOURCES		CITY A	CITY B	CITY C	SUPPLY
	COMPANY 1	C_{1A}	C_{1B}	C_{1C}	a1
	COMPANY 2	C_{2A}	C_{2B}	C_{2C}	a2
	COMPANY 3	C_{3A}	C_{3B}	C_{3C}	a3
	DEMAND	b1	b2	b3	$\Sigma a = \Sigma b$

The transportation of mobile phones should be done in such a way, that the total transportation cost is minimum.

TYPES OF TRANSPORTATION PROBLEMS

There are two types of transportation problems.

i) Balanced Transportation Problems

The sum of supply and sum of demand are same.

$\sum$ Supply = $\sum$ Demand

ii) Unbalanced Transportation Problems

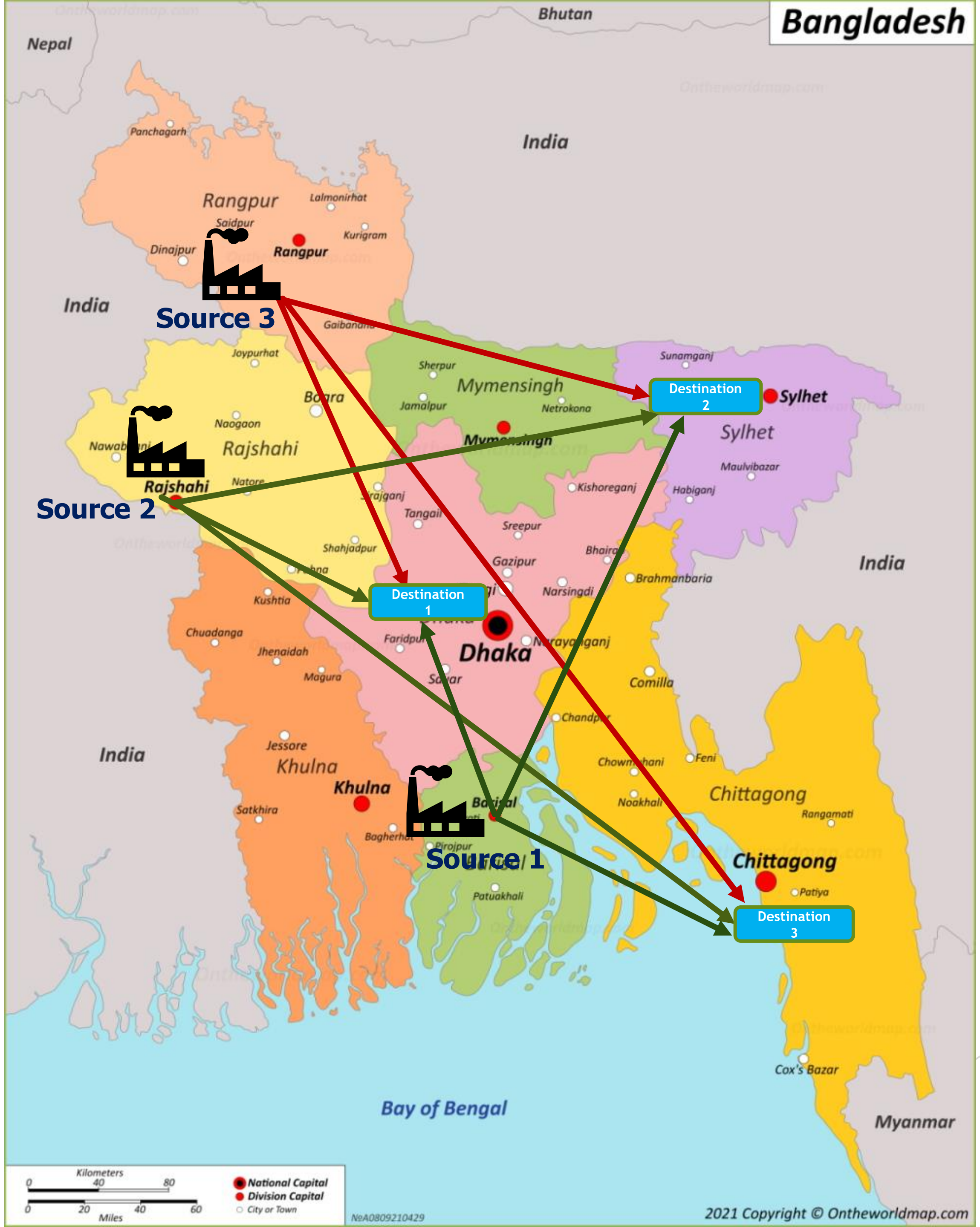
The sum of supply and sum of demand are different.

$\sum$ Supply ≠ $\sum$ Demand

METHODS TO SOLVE TRANSPORTATION MODEL

i. **North-West Corner Method**

ii. **Least Cost Method**


Bangladesh
Source 3
Source 2
Source 1
Destination 1
Destination 2
Destination 3
Nepal
Bhutan
India
Myanmar
Bay of Bengal
Rangpur
Rajshahi
Mymensingh
Sylhet
Dhaka
Khulna
Chittagong
Barisal
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NORTH-WEST CORNER METHOD

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

The North West Corner Method is one of the methods to obtain a basic feasible solution of the transportation problems (special case of LPP).

We will now see how to apply this very simple method to a transportation problem.

We will study steps of this method while applying it in the problem itself.

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

A mobile phone manufacturing company has three branches located in three different regions, say Barishal, Rajshahi, and Rangpur.

The company has to transport mobile phones to three destinations, say Dhaka, Sylhet and Chittagong.

The availability from Barishal, Rajshahi, and Rangpur is 40, 60 and 70 units respectively.

The demand at Dhaka, Sylhet, and Chittagong are 70, 40 and 60 respectively.

The transportation cost is shown in the matrix below (in Tk.).

Use the **North-West Corner Method** to find a **basic feasible solution** (**BFS**).

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

DESTINATIONS					
SOURCES		Dhaka	Sylhet	Chittagong	SUPPLY
	Barishal	4	5	1	40
	Rajshahi	3	4	6	60
	Rangpur	6	2	8	70
	DEMAND	70	40	60	170

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

Step 1: Balance the problem

Balance the problem meaning we need to check that if; $\sum$ Supply = $\sum$ Demand

If this holds true, then we will consider the given problem as a balanced problem.

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

Step 2: Start allocating from North-West corner cell

We will start the allocation from the left hand top most corner (north-west) cell in the matrix and make allocation based on availability and demand.

Now, verify the smallest among the availability (Supply) and requirement (Demand), corresponding to this cell.

The smallest value will be allocated to this cell and check out the difference in supply and demand, representing that supply and demand are fulfilled, as shown below.

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

DESTINATIONS					
		Dhaka	Sylhet	Chittagong	SUPPLY
SOURCES	Barishal	4 (40)	5	1	40 (0)
	Rajshahi	3	4	6	60
	Rangpur	6	2	8	70
	DEMAND	70 (30)	40	60	

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

DESTINATIONS					
SOURCES		Dhaka	Sylhet	Chittagong	SUPPLY
	~~Barishal~~	~~4 (40)~~	~~5~~	~~1~~	~~40 (0)~~
	Rajshahi	3	4	6	60
	Rangpur	6	2	8	70
	DEMAND	~~70~~ (30)	40	60	

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

Step 3: Remove the row or column whose supply or demand is fulfilled and prepare a new matrix

As we have fulfilled the availability or requirement for that row or column respectively, remove that row or column and prepare a new matrix, as shown below.

DESTINATIONS					
SOURCES		Dhaka	Sylhet	Chittagong	SUPPLY
	Rajshahi	3	4	6	60
	Rangpur	6	2	8	70
	DEMAND	30	40	60	

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

Step 4: Repeat the procedure until all the allocations are over

Repeat the same procedure of allocation of the new North-west corner so generated and check based on the smallest value as shown below, until all allocations are over.

DESTINATIONS					
		Dhaka	Sylhet	Chittagong	SUPPLY
SOURCES	Rajshahi	3 (30)	4	6	60 (30)
	Rangpur	6	2	8	70
	DEMAND	30 (0)	40	60	

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

Step 4: Repeat the procedure until all the allocations are over

DESTINATIONS					
SOURCES		~~Dhaka~~	Sylhet	Chittagong	SUPPLY
	Rajshahi	~~3 (30)~~	4	6	~~60~~ (30)
	Rangpur	~~6~~	2	8	70
	DEMAND	~~30 (0)~~	40	60	

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

Step 4: Repeat the procedure until all the allocations are over

DESTINATIONS				
SOURCES		Sylhet	Chittagong	SUPPLY
	Rajshahi	**4 (30)**	**6**	**30 (0)**
	Rangpur	**2**	**8**	**70**
	DEMAND	**40 (10)**	**60**	

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

Step 4: Repeat the procedure until all the allocations are over

		DESTINATIONS		
SOURCES		Sylhet	Chittagong	SUPPLY
	~~Rajshahi~~	4 ~~(30)~~	~~6~~	~~30~~ ~~(0)~~
	Rangpur	2	8	70
	DEMAND	~~40~~ (10)	60	

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

Step 4: Repeat the procedure until all the allocations are over

DESTINATIONS				
SOURCES		Sylhet	Chittagong	SUPPLY
	Rangpur	2 (10)	8 (60)	70 (60) (0)
	DEMAND	10 (0)	60 (0)	

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

Step 4: Repeat the procedure until all the allocations are over

DESTINATIONS				
SOURCES		Sylhet	Chittagong	SUPPLY
	~~Rangpur~~	~~2~~ ~~(10)~~	~~8~~ ~~(60)~~	(0)
	DEMAND	(0)	(0)	

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

Step 5: After all the allocations are over, write the allocations and calculate the transportation cost

Once all allocations are over, prepare the table with all allocations marked and calculate the transportation cost as follows.

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

Step 5: After all the allocations are over, write the allocations and calculate the transportation cost

DESTINATIONS					
		Dhaka	Sylhet	Chittagong	SUPPLY
SOURCES	Barishal	4	5	1	40
	Rajshahi	3	4	6	60
	Rangpur	6	2	8	70
	DEMAND	70	40	60	170

METHODS TO SOLVE TRANSPORTATION MODEL

i. North-West Corner Method

Sample Problem# 1

Solution

DESTINATIONS					
		Dhaka	Sylhet	Chittagong	SUPPLY
SOURCES	Barishal	4 (40)	5	1	40
	Rajshahi	3 (30)	4 (30)	6	60
	Rangpur	6	2 (10)	8 (60)	70
	DEMAND	70	40	60	170

Total Transportation Costs = $(4\times40)+(3\times30)+(4\times30)+(2\times10)+(8\times60)$

= Tk. 870/-

LEAST COST METHOD

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

A mobile phone manufacturing company has three branches located in three different regions, say Barishal, Rajshahi, and Rangpur.

The company has to transport mobile phones to three destinations, say Dhaka, Sylhet and Chittagong.

The availability from Barishal, Rajshahi, and Rangpur is 40, 60 and 70 units respectively.

The demand at Dhaka, Sylhet, and Chittagong are 70, 40 and 60 respectively.

The transportation cost is shown in the matrix below (in Tk.).

Use the **Least Cost Method** to find a **basic feasible solution** (**BFS**).

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

DESTINATIONS					
SOURCES		Dhaka	Sylhet	Chittagong	SUPPLY
	Barishal	4	5	1	40
	Rajshahi	3	4	6	60
	Rangpur	6	2	8	70
	DEMAND	70	40	60	170

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

Solution

Step 1: Balance the problem

The given Transportation problem is balanced as the ∑ Supply = ∑ Demand

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

Solution

Step 2: Select the lowest cost from the entire matrix and allocate the minimum of supply or demand

DESTINATIONS					
SOURCES		Dhaka	Sylhet	Chittagong	SUPPLY
	Barishal	4	5	1 (40)	40 (0)
	Rajshahi	3	4	6	60
	Rangpur	6	2	8	70
	DEMAND	70	40	60 (20)	

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

Solution

DESTINATIONS					
SOURCES		Dhaka	Sylhet	Chittagong	SUPPLY
	~~Barishal~~	4	~~5~~	~~1~~ ~~(40)~~	~~40~~ (0)
	Rajshahi	3	4	6	60
	Rangpur	6	2	8	70
	DEMAND	70	40	~~60~~ (20)	

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

Solution

Step 3: Remove the row or column whose supply or demand is fulfilled and prepare a new matrix.

DESTINATIONS					
SOURCES		Dhaka	Sylhet	Chittagong	SUPPLY
	Rajshahi	**3**	**4**	**6**	**60**
	Rangpur	**6**	**2**	**8**	**70**
	DEMAND	**70**	**40**	**20**	

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

Solution

Step 4: Repeat the procedure until all the allocations are over.

DESTINATIONS					
SOURCES		Dhaka	Sylhet	Chittagong	SUPPLY
	Rajshahi	3	4	6	60
	Rangpur	6	2 (40)	8	70 (30)
	DEMAND	70	40 (0)	20	

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

Solution

DESTINATIONS					
SOURCES		Dhaka	~~Sylhet~~	Chittagong	**SUPPLY**
	Rajshahi	**3**	**4**	**6**	**60**
	Rangpur	**6**	**~~2~~ ~~(40)~~**	**8**	**~~70~~ (30)**
	DEMAND	**70**	**~~40~~ (0)**	**20**	

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

Solution

DESTINATIONS				
SOURCES		Dhaka	Chittagong	SUPPLY
	Rajshahi	3	6	60
	Rangpur	6	8	30
	DEMAND	70	20	

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

Solution

DESTINATIONS				
SOURCES		Dhaka	Chittagong	SUPPLY
	Rajshahi	3 (60)	6	60 (0)
	Rangpur	6	8	30
	DEMAND	70 (10)	20	

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

Solution

DESTINATIONS				
SOURCES		Dhaka	Chittagong	SUPPLY
	Rajshahi	~~3~~ ~~(60)~~	~~6~~	~~60~~ (0)
	Rangpur	6	8	30
	DEMAND	70 (10)	20	

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

Solution

DESTINATIONS				
SOURCES		Dhaka	Chittagong	SUPPLY
	Rangpur	6	8	30
	DEMAND	10	20	

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

Solution

DESTINATIONS				
SOURCES		Dhaka	Chittagong	SUPPLY
	Rangpur	6 (10)	8 (20)	30 (20) (0)
	DEMAND	10 (0)	20 (0)	

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

Solution

Step 5: After all allocations are over, write the allocations and calculate the transportation costs.

METHODS TO SOLVE TRANSPORTATION MODEL

ii. Least Cost Method

Sample Problem# 2

Solution

DESTINATIONS					
		Dhaka	Sylhet	Chittagong	SUPPLY
SOURCES	Barishal	4	5	1 (40)	40
	Rajshahi	3 (60)	4	6	60
	Rangpur	6 (10)	2 (40)	8 (20)	70
	DEMAND	70	40	60	170

Total Transportation Costs = (1×40)+(3×60)+(6×10)+(2×40)+(8×20)

= Tk. 520/-

Unbalanced Transportation Problems

METHODS TO SOLVE TRANSPORTATION MODEL

Solve the following problem for BFS using Least Cost Method

DESTINATIONS					
SOURCES		A	B	C	SUPPLY
	P	5	1	7	20
	Q	7	4	6	70
	R	3	2	5	25
	DEMAND	65	30	50	

METHODS TO SOLVE TRANSPORTATION MODEL

Solve the following problem for BFS using Least Cost Method

Sample Problem# 4

Solution

Step 1: Balance the problem

The given Transportation problem is unbalanced as the
∑ Supply ≠ ∑ Demand

As the ∑ Supply = 115 and the
∑ Demand = 145

DESTINATIONS					
		A	B	C	SUPPLY
SOURCES	P	5	1	7	20
	Q	7	4	6	70
	R	3	2	5	25
	DEMAND	65	30	50	145//115

METHODS TO SOLVE TRANSPORTATION MODEL

Solution

Step 1: Balance the problem

Therefore, Dummy Row 'D_1" is added with the supply of 30 units in order to balance the Transport problem.

DESTINATIONS					
SOURCES		A	B	C	SUPPLY
	P	5	1	7	20
	Q	7	4	6	70
	R	3	2	5	25
	D_1	0	0	0	30
	DEMAND	65	30	50	145

METHODS TO SOLVE TRANSPORTATION MODEL

Solution

Step 2: Select the lowest cost from the entire matrix and allocate the minimum of supply or demand

DESTINATIONS					
SOURCES		A	B	C	SUPPLY
	P	5	1 (20)	7	20 (0)
	Q	7	4	6	70
	R	3	2	5	25
	D_1	0	0	0	30
	DEMAND	65	30 (10)	50	

METHODS TO SOLVE TRANSPORTATION MODEL

Solution

Step 2: Select the lowest cost from the entire matrix and allocate the minimum of supply or demand

DESTINATIONS					
SOURCES		A	B	C	SUPPLY
	~~P~~	~~5~~	~~1 (20)~~	~~7~~	~~20~~ (0)
	Q	7	4	6	70
	R	3	2	5	25
	D_1	0	0	0	30
	DEMAND	65	30 (10)	50	

METHODS TO SOLVE TRANSPORTATION MODEL

Solution

Step 3: Remove the row or column whose supply or demand is fulfilled and prepare a new matrix

DESTINATIONS					
SOURCES		A	B	C	SUPPLY
	Q	7	4	6	70
	R	3	2	5	25
	D_1	0	0	0	30
	DEMAND	65	10	50	

METHODS TO SOLVE TRANSPORTATION MODEL

Solution

Step 3: Remove the row or column whose supply or demand is fulfilled and prepare a new matrix

DESTINATIONS					
SOURCES		A	B	C	SUPPLY
	Q	7	4	6	70
	R	3	2 (10)	5	25 (15)
	D_1	0	0	0	30
	DEMAND	65	10 (0)	50	

METHODS TO SOLVE TRANSPORTATION MODEL

Solution

Step 3: Remove the row or column whose supply or demand is fulfilled and prepare a new matrix

DESTINATIONS					
SOURCES		A	~~B~~	C	SUPPLY
	Q	**7**	~~**4**~~	**6**	**70**
	R	**3**	~~**2**~~ **(10)**	**5**	**25 (15)**
	D_1	**0**	~~**0**~~	**0**	**30**
	DEMAND	**65**	~~**10**~~ **(0)**	**50**	

METHODS TO SOLVE TRANSPORTATION MODEL

Solution

Step 4: Repeat the procedure until all the allocations are over

DESTINATIONS				
SOURCES		A	C	SUPPLY
	Q	7	6	70
	R	3 (15)	5	15 (0)
	D_1	0	0	30
	DEMAND	65 (50)	50	

METHODS TO SOLVE TRANSPORTATION MODEL

Solution

Step 4: Repeat the procedure until all the allocations are over

		DESTINATIONS		
SOURCES		A	C	SUPPLY
	Q	7	6	70
	~~R~~	~~3~~ ~~(15)~~	~~5~~	~~15~~ (0)
	D_1	0	0	30
	DEMAND	65 (50)	50	

METHODS TO SOLVE TRANSPORTATION MODEL

Solution

Step 4: Repeat the procedure until all the allocations are over

DESTINATIONS				
SOURCES		A	C	SUPPLY
	Q	7	6 (50)	70 (20)
	D_1	0	0	30
	DEMAND	50	50 (0)	

METHODS TO SOLVE TRANSPORTATION MODEL

Solution

Step 4: Repeat the procedure until all the allocations are over

		DESTINATIONS		
SOURCES		A	~~C~~	SUPPLY
	Q	7	~~6~~ ~~(50)~~	70 (20)
	D_1	0	0	30
	DEMAND	50	~~50~~ (0)	

METHODS TO SOLVE TRANSPORTATION MODEL

Solution

Step 4: Repeat the procedure until all the allocations are over

DESTINATIONS			
SOURCES		A	SUPPLY
	Q	7 (20)	20 (0)
	D_1	0 (30)	30 (0)
	DEMAND	50 (30) (0)	

METHODS TO SOLVE TRANSPORTATION MODEL

Solution

Step 5: After all allocations are over, write all the allocations and calculate the transportation cost.

DESTINATIONS					
SOURCES		A	B	C	SUPPLY
	P	5	1 (20)	7	20
	Q	7 (20)	4	6 (50)	70
	R	3 (15)	2 (10)	5	25
	D_1	0 (30)	0	0	30
	DEMAND	65	30	50	145

Total Transportation Costs = (1×20)+(7×20)+(6×50)+(3×15)+(2×10)+(0×30)

= Tk. 525/-

METHODS TO SOLVE TRANSPORTATION MODEL

NOTE

If the sum of demand is less than the sum of supply, then we will have to add a "Dummy Column".

DESTINATIONS					
		A	B	C	SUPPLY
SOURCES	P	**5**	**1**	**7**	**65**
	Q	**7**	**4**	**6**	**30**
	R	**3**	**2**	**5**	**50**
	DEMAND	**20**	**70**	**25**	**115//145**

METHODS TO SOLVE TRANSPORTATION MODEL

NOTE

In order to balance the Transportation problem, we have to add "0" in the "Dummy Column" having demand of 30

DESTINATIONS						
SOURCES		A	B	C	D_1	SUPPLY
	P	5	1	7	0	65
	Q	7	4	6	0	30
	R	3	2	5	0	50
	DEMAND	20	70	25	30	145//145

Further, we can solve this by using any of the discussed method (NWCM, LCM or VAM)

PRACTICE PROBLEM…

Problem…

Explanation:

Given three sources O1, O2 and O3 and four destinations D1, D2, D3 and D4.

For the sources O1, O2 and O3, the supply is 300, 400 and 500 respectively.

The destinations D1, D2, D3 and D4 have demands 250, 350, 400 and 200 respectively.

Based on the matrix given in the next slide, calculate the Transportation Costing for **North-West Corner Method** and **Least Cost Method**, and comment on which transportation method is ideal to be chosen?

PRACTICE PROBLEM…

Problem…

DESTINATIONS						
		D1	D2	D3	D4	SUPPLY
SOURCES	Q1	3	1	7	4	300
	Q2	2	6	5	9	400
	Q3	8	3	3	2	500
	DEMAND	250	350	400	200	

END OF THE CHAPTER…

PRACTICE PROBLEM…

Problem…

DESTINATIONS						
SOURCES		D1	D2	D3	D4	SUPPLY
	Q1	3	3001	7	4	300
	Q2	2502	6	1505	9	400
	Q3	8	503	2503	2002	500
	DEMAND	250	350	400	200	

EXERCISE: NORTH-WEST CORNER METHOD

- A dairy firm has three plants located throughout a state. Daily milk production at each plant is as follows:

  Plant 1: 6 million litres; Plant 2: 1 million litres and Plant 3: 10 million litres

Each Day the firm must fulfil the needs of its distribution centres. Minimum requirement at each centre is as follows:

Distribition centre 1: 7 million litres

Distribition centre 2: 5 million litres

Distribition centre 3: 3 million litres

Distribition centre 4: 2 million litres

Cost of shipping one million litres of milk from each plant to each distribution centre is given in the following table in hundred of BDT.

	DC1	DC2	DC3	DC4
Plant 1	2	3	11	7
Plant 2	1	0	6	1
Plant3	5	8	15	9

Find its initial basic feasible solution by North-West Corner method.

EXERCISE: NORTH-WEST CORNER METHOD

- Start with the north-west (upper left) corner cell of the transportation matrix. Compare the supply of source 1 (S_1) with the demand of destination 1 (D_1).
  - $S_1 > D_1$, set $X_{11} = D_1$ and proceed horizontally to cell (1,2)
  - If $S_1 = D_1$, set $X_{11} = D_1$ and proceed diagonally to cell (2,2)
  - If $S_1 < D_1$, set $X_{11} = S_1$ and proceed vertically to cell (2,1)

- Continue the procedure, step by step, away from the north-west corner cell till an allocation is made in the south-east corner cell.

	DC1	DC2	DC3	DC4
Plant 1	6 2	3	11	7
Plant 2	1 1	0	6	1
Plant 3	5	5 8	3 15	2 9

EXERCISE: NORTH-WEST CORNER METHOD

- It can be easily seen that the proposed solution is a feasible solution since all the supply and requirement constraints are fully satisfied.

- The transportation cost with the solution is

  Z= BDT (2X6 + 1X1 + 8X5 + 15X3 + 9X2) X 100

  = BDT 11, 600/00

EXERCISE: LEAST COST METHOD

- A dairy firm has three plants located throughout a state. Daily milk production at each plant is as follows:

  Plant 1: 6 million litres; Plant 2: 1 million litres and Plant 3: 10 million litres

Each Day the firm must fulfil the needs of its distribution centres. Minimum requirement at each centre is as follows:

Distribition centre 1: 7 million litres

Distribition centre 2: 5 million litres

Distribition centre 3: 3 million litres

Distribition centre 4: 2 million litres

Cost of shipping one million litres of milk from each plant to each distribution centre is given in the following table in hundred of BDT.

	DC1	DC2	DC3	DC4
Plant 1	2	3	11	7
Plant 2	1	0	6	1
Plant3	5	8	15	9

Find its initial basic feasible solution by Least Cost method.

EXERCISE: LEAST COST METHOD

- Here, the lowest cell is (2,2) and maximum possible allocation (meeting supply and requirement positions) is made here. Evidently, maximum feasible allocation I cell (2, 2) is 1 m litres. This meets the supply position of plant 2. Therefore, row 2 is crossed out, indicating that no allocations are to be made in cells (2,1), (2,3), and (2,4).
- The next lowest cell (excluding the cells in row 2) is (1,1) and maximum possible allocation (meeting supply and requirement positions) of 6 is made here. Now row 1 is crossed out.
- Next lowest cell in row 3 is (3,1) and allocation is 1 is done here.
- Likewise allocations of 4, 2, and 3 are done in cells (3,2), (3,4) and (3,3) respectively.

	DC1		DC2		DC3		DC4	
Plant 1	6	2		3		11		7
Plant 2		1	1	0		6		1
Plant3	1	5	4	8	3	15	2	9

EXERCISE: LEAST COST METHOD

- It can be easily seen that the proposed solution is a feasible solution since all the supply and requirement constraints are fully satisfied.

- The transportation cost with the solution is

  Z= BDT (2X6 + 0X1 + 5X1 + 8X4 +15X3 + 9X2) X 100

  = BDT (12+0+5+32+45+18) X 100

  = BDT 11, 200/00