

## TRANSPORTATION

1. An oil corporation has got three refineries P, Q, and R and it has to send petrol to four different depots A, B, C and D. The cost of shipping 1 gallon of petrol from each refinery to each depot is given below. The requirements of the depots and the available petrol at the refineries are also given. Find the minimum cost of shipping:

| Refinery | Depot |     |     |     | Available |
|----------|-------|-----|-----|-----|-----------|
|          | A     | B   | C   | D   |           |
| P        | 10    | 12  | 15  | 8   | 130       |
| Q        | 14    | 11  | 9   | 10  | 150       |
| R        | 20    | 5   | 7   | 18  | 170       |
| Required | 90    | 100 | 140 | 120 |           |

2. The Agri-Products Company has two factories, at Tiruchi and Meerut. There are four major warehouses to which the finished products are sent : at Guwahati, Nagpur, Ahmedabad and Chandigarh. The Company plans to locate an additional factory at either Indore or at Kanpur. If the following matrix gives the details of the shipping costs, manufacturing capacities and warehouse requirements, how would you go about choosing between the two proposed locations, i.e. Indore and Kanpur. Suggest an approach.

| Place          | Shipping Costs ` per Unit |        |           |            | Capacity |
|----------------|---------------------------|--------|-----------|------------|----------|
|                | Guwahati                  | Nagpur | Ahmedabad | Chandigarh |          |
| Tiruchi        | 25                        | 9      | 10        | 20         | 220      |
| Meerut         | 10                        | 8      | 6         | 5          | 380      |
| Indore         | 15                        | 2      | 4         | 10         | 200      |
| Kanpur         | 9                         | 7      | 7         | 5          | 200      |
| Units Required | 100                       | 150    | 300       | 250        |          |

- 3.

| Factory | Destination |    |    | Supply to be exhausted |
|---------|-------------|----|----|------------------------|
|         | 1           | 2  | 3  |                        |
| A       | 5           | 1  | 7  | 10                     |
| B       | 6           | 4  | 6  | 80                     |
| C       | 3           | 2  | 5  | 15                     |
| Demand  | 75          | 20 | 50 |                        |

Since there is not enough supply, some of the demands at the three destinations may not be satisfied. For the unsatisfied demands, let the penalty costs be rupees 1,2 and 3 for destinations (1), (2) and (3) respectively. Management is committed to transfer 20 units from factory B to Destination-1. Find the optimal allocation that minimizes the transportation and penalty costs.

4. A company has four factories F1, F2, F3 and F4 manufacturing the same, product. Production and raw material costs differ from factory to factory and are given in the following table in the first two rows. The transportation costs from the factories to sales depots, S1, S2, S3, are also given. The last two columns in the table give the sales price and the total requirement at each depot. The production capacity of each factory is given in the last row.

|                        | F <sub>1</sub> | F <sub>2</sub> | F <sub>3</sub> | F <sub>4</sub> | Sales price<br>per unit | Requirement |
|------------------------|----------------|----------------|----------------|----------------|-------------------------|-------------|
| Production cost/unit   | 15             | 18             | 14             | 13             |                         |             |
| Raw material cost/unit | 10             | 9              | 12             | 9              |                         |             |

|          | <u>Transportation Cost per unit</u> |     |    |     |    |     |
|----------|-------------------------------------|-----|----|-----|----|-----|
| S1       | 3                                   | 9   | 5  | 4   | 34 | 80  |
| S2       | 1                                   | 7   | 4  | 5   | 32 | 120 |
| S3       | 5                                   | 8   | 3  | 6   | 31 | 150 |
| capacity | 10                                  | 150 | 50 | 100 |    |     |

Determine the most profitable production and distribution schedule and the corresponding profit.  
The surplus production should be taken to yield zero profit.

Find the amount of profit if 10 units are to be allotted to  $S_1F_1$  cell?