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CS/M.Tech (ME)/SEM-1/PTM-104A/2010-11

2010-11

OPERATIONS RESEARCH

Time Allotted : 3 Hours *Full Marks :* 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions. $5 \times 14 = 70$

1. A manufacturing company produces two items A & B. A needs 2 hours on machine M_1 and 2 hours on machine M_2. B needs 3 hours on machine M_1 and 1 hour on machine M_2 If machine M_1 can run for a maximum of 12 hours per day and M_2 for 8 hours per day and profits from A and B are Rs. 4 and Rs. 5 per item respectively. Find by Simplex method, how many items per day be produced to have maximum profit.

2. Solve the following by Big M method :

   Maximize : $Z = -3x_1 + x_2 + x_3$

   Subject to : $x_1 - 2x_2 + x_3 \le 11$

   $-4x_1 + x_2 + 2x_3 \ge 3$

   $2x_1 - x_3 = -1$

   $x_1 \ge 0, x_2 \ge 0, x_3 \ge 0.$

3. Obtain the initial solution in the following transportation problem by Vogel's approximation method :

Warehouse / Factory	W_1	W_2	W_3	W_4	Capacity
F_1	7	3	5	5	34
F_2	5	5	7	6	15
F_3	8	6	6	5	12
F_4	6	1	6	4	19
Requirement	21	25	17	17	80

4. Suggest optimum assignment of four workers A, B, C & D to four jobs. The time taken by different workers for completing different jobs is given below.

Jobs / Workers	J_1	J_2	J_3	J_4
W_1	15	29	35	20
W_2	21	27	33	17
W_3	17	25	37	15
W_4	14	31	39	21

Also indicate the total time taken in completing the jobs.

5. The demand for an item is deterministic and constant over the time and it is equal to 600 units per year. The per unit cost of the item is Rs. 50 while the cost of placing an order is Rs. 5. The inventory carrying cost is 20% of the cost of inventory per annum and the cost of shortage is Rs. 1 per unit per month. Find the optimal ordering quantity when stockouts are permitted. If the stockouts are not permitted, what will be the loss of the company ?

6. Deduce the relationship for $P (d \geq Q)$

A television dealer finds that cost of holding a television in stock for a week is Rs. 30 and the cost of unit shortage is Rs. 70. For one particular model of television, the probability distribution of weekly sales is as follows :

Weekly sales :	0	1	2	3	4	5	6
Probability :	0·05	0·1	0·2	0·25	0·2	0·15	0·05

How many units per week should the dealer order ?

7. The following table shows the number of motor registrations in a certain territory for a term of 5 years and the sale of motor tyres by a firm in that territory for the same period.

Year	Motor Registration	No. of Tyres sold
1	600	1250
2	630	1100
3	720	1300
4	750	1350
5	800	1500

Find the regression equation to estimate the sale of tyres when motor registration is known. Estimate sale of tyres when registration is 850.

8. Write short notes on any *four* of the following : $4 \times 3\frac{1}{2}$

i) Basic solution and basic feasible solution

ii) Degenerate and non-degenerate basic feasible solution

iii) Inventory and inventory control

iv) Classes of inventories

v) Inventory costs

vi) PERT and CPM.