

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**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 :

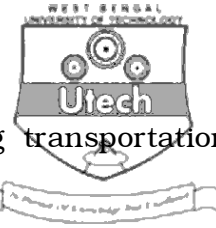
Maximize :  $Z = -3x_1 + x_2 + x_3$

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

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

$2x_1 - x_3 = -1$

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



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 :  $4 \times 3\frac{1}{2}$
- Basic solution and basic feasible solution
  - Degenerate and non-degenerate basic feasible solution
  - Inventory and inventory control
  - Classes of inventories
  - Inventory costs
  - PERT and CPM.

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