



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/M.TECH(ME)/SEM-1/PTM-104(A)/2011-12**

**2011**

**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 × 14 = 70

1. Solve the following problem by Simplex method : 14

$$\text{Maximize } Z = 3x_1 + 2x_2 + 3x_3$$

Subject to the constraints

$$2x_1 + x_2 + x_3 \leq 2$$

$$3x_1 + 4x_2 + 2x_3 \geq 8$$

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

2. Solve the following unbalanced assignment problem of minimizing total time ( hours ) for doing all the jobs :

Job Operator	1	2	3	4	5
A	6	2	5	2	6
B	2	5	8	7	7
C	7	8	6	9	8
D	6	2	3	4	5
E	9	3	8	9	7
F	4	7	4	6	8

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3. Find the starting solution in the following transportation problem by

- Least cost method
- Vogel's approximation method and compare the transportation costs :

Warehouse Factory	W1	W2	W3	W4	W5	Capacity
F1	20	28	32	55	70	50
F2	48	36	40	44	25	100
F3	35	55	22	45	48	150
Requirement	100	70	50	40	40	

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4. Prove the relation  $Q^* = (2DC_o / C_h)^{1/2}$

A manufacturer has to supply his customers 600 units of his products per year. The inventory carrying cost is Rs. 0.60 per year. Ordering cost is Rs. 80 per order. Find :

- The economic order quantity
- The minimum average yearly cost
- The optimum number of orders per year
- The optimum period of supply
- The increase in the total cost associated with ordering 20% more than EOQ.

4 + 10



5. Deduce the relation  $P(d \geq Q)$

A contractor of second hand motor trucks maintains a stock of trucks every month. The demand of the trucks occur at a relatively constant rate but not in constant size. The demand follows the probability distribution :

<i>Demand</i>	0	1	2	3	4	5	6
<i>Probability</i>	0.50	0.24	0.20	0.10	0.05	0.01	0.00

The holding cost of an old truck for one month is Rs. 100 and the penalty for a truck if not supplied on demand is Rs. 1000. Determine the optimum size of stock of the contractor.

4 + 10

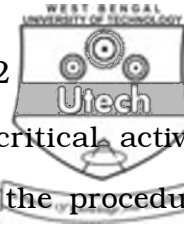
6. The quantity of a raw material purchased by a company at the specified prices during the 12 months of 2008 are given below :

<i>Months</i>	<i>Price per Kg (Rs.)</i>	<i>Quantity (Kg)</i>	<i>Months</i>	<i>Price per Kg. (Rs.)</i>	<i>Quantity (Kg)</i>
January	96	250	July	112	220
February	110	200	August	112	220
March	100	250	September	108	200
April	90	280	October	116	210
May	86	300	November	86	300
June	92	300	December	92	250

- Find the regression equations based on the above data.
- Estimate the approximate quantity likely to be purchased if the price shoots up to Rs. 124 per Kg.
- Hence or otherwise obtain the co-efficient of correlations between price prevailing and the quantity demanded.

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7. What is project management ? Define critical activity.  
Compare between PERT & CPM. What are the procedures  
for PERT analysis ? Explain crashing of network. 14

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

- i) Slack variables and surplus variables.
- ii) Degenerate and non degenerate basic feasible solutions.
- iii) Economic order quantity
- iv) Inventory costs.
- v) Lead time.
- vi) Regression equations.

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