



Name :
Roll No. :
Invigilator's Signature :

CS/B.TECH (AUE)/SEM-7/AUE-702/2011-12

2011

**OPERATION RESEARCH & INDUSTRIAL
MANAGEMENT**

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.*

**GROUP – A
(Multiple Choice Type Questions)**

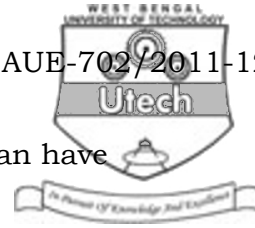
1. Choose the correct alternatives for the following :

10 × 1 = 10

- i) VED analysis is applied for determining
- | | |
|----------------------|---------------------|
| a) slow moving items | b) high value items |
| c) critical items | d) none of these. |
- ii) PERT is
- | | |
|-------------------|----------------------|
| a) event oriented | b) activity oriented |
| c) cost oriented | d) any of these. |



- iii) Choose the most correct alternative related to primal-dual LP problems from the following :
- a) Shadow prices of resources in optimal solution of the primal are optimal values of the dual variables.
 - b) The optimal values of the objective functions of primal and dual are the same.
 - c) If the primal problem has unbounded solution, the dual problem would have infeasibility
 - d) All of these.
- iv) A solution to a transportation problem is degenerate when (where r = no. of rows and c = no. of columns)
- a) the number of the unoccupied cells is less than $(r + c - 1)$
 - b) the number of the unoccupied cells is equal to $(r + c - 1)$
 - c) the number of the occupied cells is at least $(r + c - 1)$
 - d) the number of the occupied cells is less than $(r + c - 1)$
- v) For a 25% increase in order quantity in classical EOQ model, the total relevant cost would be
- a) decreased by 2.5 % b) decreased by 0.25%
 - c) increased by 2.5% d) increased by 1.025%.



- vi) The arrival time in a queuing model can have
- a) Poisson distribution
 - b) Exponential distribution
 - c) Erlang distribution
 - d) all of these.
- vii) Which of the following is not associated with LPP ?
- a) Proportionality b) Uncertainty
 - c) Additivity d) Divisibility.
- viii) Job satisfaction refers to
- a) attitude of an employee towards his/her work
 - b) work culture
 - c) relationship between supervisors and subordinates
 - d) performance appraisal.
- ix) CPM networks are related to
- a) single estimate of activity time
 - b) deterministic activity times
 - c) any of these
 - d) none of these.
- x) An arrow of CPM and PERT network shows
- a) activity b) events
 - c) any of these d) none of these.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.

$$3 \times 5 = 15$$

2. Write a short note on Management by Objectives (MBO).
3. With the help of quantity-cost curve, explain the significance of Economic Order Quantity (EOQ).
4. Briefly discuss about the different selective inventory control techniques.
5. Discuss about crashing of projects related with project management.
6. Define float, total float and independent float related with project management.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

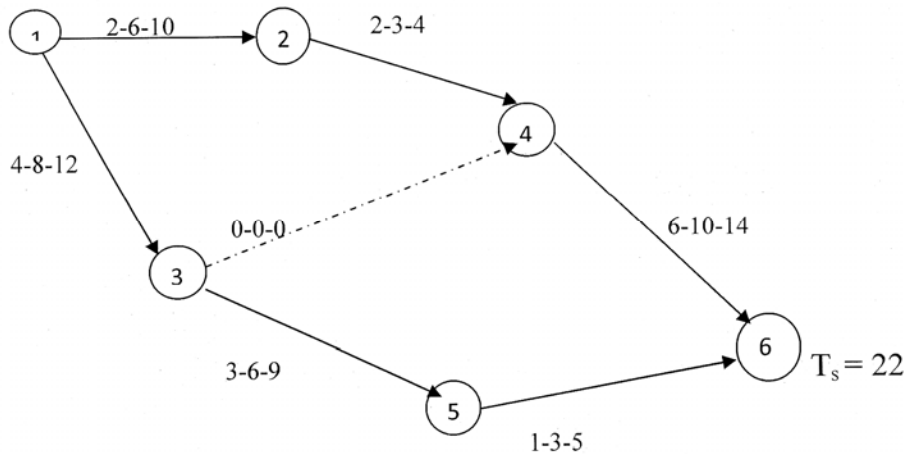
7. a) State when degeneracy and multiple optimal solutions occur in LPP. 3
- b) Solve the following linear programming problem using Big M Method : 10
$$\text{Min } Z = 40 x_1 + 24 x_2$$

subject to $20 x_1 + 50 x_2 \geq 4800$

$$80 x_1 + 50 x_2 \geq 8$$
$$4 x_1 + 5 x_2 \leq 7200$$
$$x_1, x_2 \geq 0.$$
- c) What are the significances of exchange ratio and slack variables in Simplex Method ? 2



8. a) What is work breakdown structure ? 2
- b) Explain Fulkerson's rule. 3
- c) The following PERT network is given for a project. The values of the optimistic time, the pessimistic time and the most likely time are given. Calculate the expected time or average time, variance, the earliest expected time, the latest allowable occurrence time and the probability of finishing the project in 22 days. Use the standard table. 10



9. a) A company management and the labour union are negotiating a new three year settlement. Each of these has four strategies, namely I, II, III and IV.

I – Hard strategy

II – Logical strategy

III – Legalistic strategy

IV – Conciliatory strategy



The cost to the company are given below for every pair of strategy choice.

Union	Company strategies			
Strategies	I	II	III	IV
I	20	15	12	35
II	25	14	8	10
III	40	2	10	5
IV	- 5	4	11	0

What strategy will the two sides adopt ? Also determine the value of the game. 5

- b) What are the methods of solving the game theory problems with no saddle point ? 3
- c) A department has five employees with five jobs to be performed. The time (in hours) each employee will take to perform each job is given in the effectiveness matrix.

Job	Employee				
	I	II	III	IV	V
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	7	11	9	7	12
E	7	9	10	4	12

How the jobs should be allocated one per employee so as to minimize the total man-hour ? 7



10. a) The production department of a company requires 3600 kg of raw materials for manufacturing a particular item every year. It has been estimated that the cost of placing an order is Rs. 36 and the cost of carrying inventory is 25% of the investment in inventories. The price is Rs. 10/kg. The purchase department wishes to determine an ordering policy for raw material. Calculate
- i) the optimal lot size
 - ii) the optimal order cycle time
 - iii) total variable cost yearly
 - iv) total cost yearly. 2 + 1 + 2 + 2
- b) Convert the following primal problem into dual problem : 4
- Min $Z = 5x_1 + 7x_2 + 9x_3$
 subject to $x_1 + x_2 + x_3 = 20$
 $x_1 + 3x_2 + 5x_3 \geq 60$
 $5x_1 - x_3 \leq 10$
 $x_3 \geq 4$
 $x_1, x_2, x_3 \geq 0$
- c) Define pure and mixed strategy in the context of game theory. 4
11. a) State the advantages of manpower planning in an organization. 3
- b) Name various incentive plans used in industry. Explain Merrick Differential Piece Rate Plan. 6
- c) What are shadow price and saddle point ? 3
- d) Compare CPM and PERT. What does the term 'CRITICAL' mean in CPM ? 3

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12. a) Differentiate between sales and marketing. 2
- b) Describe ABC inventory control system. 4
- c) Explain the role of trade unions in improvement of the atmosphere of an industry. 4
- d) What are the qualities of a leader ? What is leadership grid ? 5
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