



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech (EE)/SEM-8/EE-802D/2013**

**2013**

**PROJECT MANAGEMENT AND  
OPERATIONS RESEARCH**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

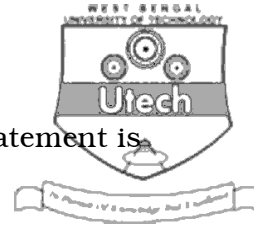
*Candidates are required to give their answers in their own words  
as far as practicable.*

*Graph sheet(s) will be provided by the Institute on demand.*

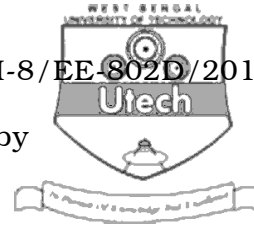
**GROUP – A**

**( Multiple Choice Type Questions )**

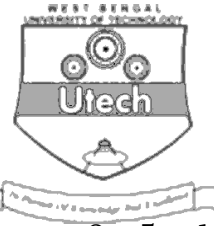
1. Choose the correct alternatives for any ten the following :  $10 \times 1 = 10$ 
  - i) In an assignment problem the basic feasible solution for the constraint equations will consists of
    - a)  $(2m + 1)$  variables
    - b)  $(2m - 1)$  variables
    - c)  $2m$  variables
    - d)  $2m^2$  variables.
  - ii) Which term is usually not a feature of a project ?
    - a) temporary
    - b) electrification
    - c) existence of sponsor or customer
    - d) uncertainty.



- iii) A hyper plane is a convex set. This statement is
- a) True
  - b) False.
- iv) If in the simplex algorithm, the basis column of the final simplex table contains an artificial variable, the problem has ..... solution.
- a) unbounded solution
  - b) degenerate solution
  - c) infeasible solution
  - d) none of these.
- v) In PERT, the activities timings are deterministic in nature. This statement is
- a) True
  - b) False.
- vi) The method of optimality test for a transportation problem is
- a) Least cost method
  - b) VAM
  - c) Row minima method
  - d) None of these.
- vii) ..... is specifically used in project management.
- a) Gantt chart
  - b) Line curve
  - c) Bar chart
  - d) Pie chart.
- viii) Economic indicators indicate the change in pattern of demand. This statement is
- a) True
  - b) False.



- ix) A mixed strategy game can be solved by
- Matrix method
  - Algebraic method
  - Graphical method
  - None of these.
- x) When maximum and minimum values of the game are same, then
- there is a saddle point
  - solution does not exist
  - strategies are mixed
  - none of these.
- xi) An activity (  $i, j$  ) is called critical activity if
- $E_i = L_j$
  - $E_j = L_i$
  - $E_j = L_j$
  - $E_j - E_i = L_j - L_i = D_{ij}$ .
- xii) The debt service coverage ratio checks the profitability of a project. This statement is
- True
  - False.
- xiii) BFS of an LPP
- Is linearly independent
  - is linearly dependent
  - either (a) or (b)
  - forms a basis.



**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following.

3 × 5 = 15

2. Solve graphically the following LPP :

Maximize :  $z = 3x_1 + 2x_2$

Subject to constraints :  $-2x_1 + x_2 = 1,$

$$x_1 + x_2 \leq 3,$$

$$x_1 \leq 2,$$

$$x_1, x_2 \geq 0$$

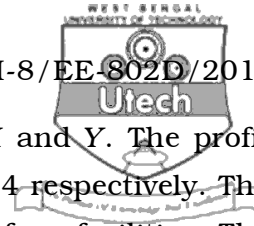
3. Find all the basic feasible solutions ( if exist ) of the equation :

$$2x_1 + x_2 + 4x_3 = 11,$$

$$3x_1 + x_2 + 5x_3 = 14.$$

4. Distinguish between resource levelling and resource allocation.
5. Solve the assignment problem by Hungarian method.

	A	B	C	D
X	18	26	17	11
Y	13	28	14	26
Z	38	19	18	15
W	19	26	24	10



6. A company manufactures two products X and Y. The profit contribution of X and Y are Rs. 3 and Rs. 4 respectively. The products X and Y require the services of four facilities. The capacities of four facilities A, B, C and D are limited and the available capacities in hours are 200 hours, 150 hours, 100 hours and 80 hours respectively. Product X requires 5, 3, 5 and 8 hours of facilities A, B, C and D respectively. Similarly requirements of products Y are 4, 5, 5 and 4 hours respectively on A, B, C and D. Find the optimal product mix to maximize the profit.

**GROUP – C**

**( Long Answer Type Questions )**

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

7. a) High quality furniture Ltd. Manufactures two products, tables & chairs. Both the products have to be processed through two machines M1 & M2 the total machine-hours available are : 200 hours of M1 and 400 hours of M2 respectively. Time in hours required for producing a chair and table on both the machines is as follows :

Machine	Time in Hours	
	Table	Chair
M1	7	4
M2	5	5

Profit from the sale of a table is Rs. 40 and that from a chair is Rs. 30. Determine optimal mix of tables & chairs so as to maximize the total profit. 7



b) Solve the LPP by simplex method :

$$\begin{aligned} \text{Maximize} \quad & Z = 4x_1 + 7x_2 \\ \text{Subject to} \quad & 2x_1 + x_2 \leq 1000 \\ & 10x_1 + 10x_2 \leq 6000 \\ & 2x_1 + 4x_2 \leq 2000 \\ & x_1, x_2 \geq 0. \end{aligned}$$

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8. a) Using graphical method, solve the following LPP :

$$\begin{aligned} \text{Max} \quad & Z = 5x_1 + 4x_2 \\ \text{Subject to} \quad & x_1 - 2x_2 \leq 1 \\ & x_1 + 2x_2 \geq 3 \\ & x_1, x_2 \geq 0. \end{aligned}$$

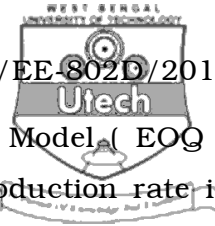
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b) Write short notes on any *two* of the following :  $2 \times 5$

- Risk associated with projects
- Project feasibility study
- What is called transportation problem ?

9. a) Solve the transportation problem by VAM and also verify the whether the solution is optimal or not ? 8

	I	II	III	$a_i$
1	8	7	3	60
2	3	8	9	70
3	11	3	5	80
$b_j$	50	80	80	



- b) Discuss the Economic Order Quantity Model (EOQ) where the demand rate is uniform, production rate is infinite, production rate is infinite and shortage are not allowed. 7

10. a) Use duality to solve the LPP :

$$\text{Min} \quad Z = 3x_1 + x_2$$

$$\text{Subject to} \quad 2x_1 + 3x_2 \geq 2,$$

$$x_1 + x_2 \geq 1,$$

$$x_1, x_2 \geq 0.$$

8

- b) The rate of use of particular raw material from stores is 20 unit per year. The cost of placing and receiving an order is Rs. 40. The cost of each unit is Rs. 100. The cost of carrying inventory in percent per year is 0.16 and it depends upon the average stock. Determine the economic order quantity and number of orders per year. 7

11. a) In a railway marshalling yard, goods trains arrival time follows an exponential distribution and the service time ( the time taken to load a train in a hump yard ) distribution is also exponential with an average 36 minutes. Calculate the following :

i) The average number of trains in the queue

ii) The probability that the queue size exceeds 10

iii) The expected waiting time in the queue. 8

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- b) Find the assignment of machines to the jobs that will maximize the profit.

	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
1	62	78	50	101	82
2	71	84	61	73	59
3	87	92	111	71	81
4	48	64	87	77	80

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