

# FIFTH SEMESTER B.TECH DEGREE EXAMINATION

Branch: Electrical & Electronics

13.506.2 Operations Research (E)

Time: 3 Hours

Max. Marks: 100

*Answer all questions*

## Part – A

1. What are the commonly used models in operations research?
2. What are the disadvantages of Big-M method over Two-phase method?
3. Distinguish between feasible solution and basic feasible solution.
4. Explain briefly any one method of obtaining initial feasible solution for a transportation problem.
5. Write the mathematical model of an assignment problem.
6. Explain a) Saddle point b) Two person zero sum game.
7. What is Laplace criterion for decision making under certainty?
8. What is meant by group replacement? How does it differ from individual replacement?
9. Explain the terms in PERT a) Expected time b) Activity Variance
10. Briefly explain different phases in network techniques.

(2×10 marks=20

marks)

## Part – B

### MODULE I

11. Solve the following LPP by formulating its dual:

$$\text{Maximise } Z = 50x_1 - 80x_2 - 140x_3$$

$$\text{Subject to } x_1 - x_2 - 3x_3 \geq 4$$

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

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

(20)

(or)

12. A company possess two manufacturing plants, each of which can produce three products X, Y, and Z from a common raw material. However, the proportions in which the products are produced are different in each plant and so plants operating costs per hour. Data on production per hour are given below together with current orders in hand of each product:

	Products			Operating cost per hour (Rs)
	X	Y	Z	
Plant A	2	4	3	9
Plant B	4	3	2	10
Orders in hand	50	60	60	

Find the number of production hours needed to fulfil the orders on hand at minimum cost.

(20)

## MODULE II

13. A company has three plants at locations A, B, C which supply to warehouses located at D, E, F, G and H. Monthly plant capacities are 800, 500, and 900 units respectively. Monthly warehouse requirements are 400, 400, 500, 400 and 800 units respectively. Unit transportation costs (in Rs) are given below. Determine an optimum distribution for the company in order to minimise the total transportation cost.

		To				
		D	E	F	G	H
From	A	5	8	6	6	3
	B	4	7	7	6	5
	C	8	4	6	6	4

**(20)**

**(or)**

14. a) A Finance Manager is considering drilling a well. In the past, only 70 per cent of wells drilled were successful at 20 metres depth in that area. Moreover on finding no water at 20 metres, some persons in that area drilled it further upto 25 metres but only 20 per cent struck water at that level. The prevailing cost of drilling is Rs.500 per metre. The Finance Manger estimated that in case he does not get water in his own well, the following decisions were considered:

(i) do not drill any well, (ii) drill upto 20 metres, (iii) if no water is found at 20 metres, drill further upto 25 metres.

Draw an appropriate decision tree and determine the Finance Manager's optimal strategy. **(16)**

- b) Briefly explain Expected Monetary Value and Expected Opportunity Loss. **(4)**

## MODULE III

15. a) The demand for an item is 6000 units per year. Its production rate is 1000 units per month. The carrying cost is Rs.50/- unit/year and the set-up cost is Rs. 20000 per set-up. The shortage cost is Rs.1000/- per year. Find various parameters of inventory system. **(10)**

- b) A newspaper boy has the following probability of selling a magazine.

No: of copies sold	10	11	12	13	14
Probability	0.1	0.15	0.	0.2	0.30
	0		2	5	

Cost of a copy is Rs. 3/- and sale price is Rs.5/-. He cannot return unsold copies.  
How many copies should he order? **(10)**

**(or)**

16. Consider the payoff matrix of player A and solve it optimally using graphical method.

		Player B				
		1	2	3	4	5
Player A	1	7	8	4	6	8
	2	-8	6	1	9	6

**(20)**

#### MODULE IV

17. a) In a supermarket, the average arrival rate of customer is 10 every 30 minutes following Poisson process. The average time taken by a cashier to list and calculate the customers purchase is 2.5 minutes following exponential distribution. What is the probability that the queue length exceeds? What is the expected time spent by a customer in the system?

**(12)**

b) What are the different types of float in critical path analysis? Explain their uses in network. **(8)**

**(or)**

18. The time and cost estimates and precedence relationship of the different activities constituting a project are given below:

Activity	Predecessor Activities	Time (in weeks)		Cost (in Rs)	
		Normal	Crash	Normal	Crash
A	-	3	2	8,000	19,000
B	-	8	6	600	1,000
C	B	6	4	10,000	12,000
D	B	5	2	4,000	10,000
E	A	13	10	3,000	9,000
F	A	4	4	15,000	15,000
G	F	2	1	1,200	

				1,400
H	C, E, G	6	4	3,500 4,500
I	F	2	1	7,000 8,000

(a) Draw a project network diagram and find the critical path

(b) If a dead line of 17 weeks is imposed for completion of the project, what activities will be crashed, what would be the additional cost and what would be critical activities of the crashed network after crashing?

**(20)**