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Total No. of Printed Pages: 02

Total no. of Questions: 9

BCA (Semester: 6th)
OPERATIONS RESEARCH
Subject Code: BMEE0F97
Paper ID: OE3160123

Time: 3 Hours

Maximum Marks: 60

Instructions to candidates

- 1) Section-A is COMPULSORY and consist of TEN questions carrying TWO marks each.
- 2) Section-B consist of FIVE questions of FIVE marks each & student has to attempt any FOUR questions.
- 3) Section-C consist of THREE questions of TEN marks each & student has to attempt any TWO questions.

Section A

(2 marks each)

Q1. Write the followings:

- a. State the role of computers in operations research.
- b. What is Duality? Explain.
- c. Differentiate between degenerate and non-degenerate solution.
- d. Differentiate between slack and float.
- e. What is a travelling salesman problem?
- f. Differentiate between PERT and CPM.
- g. State industrial applications of Queuing models.
- h. Describe the scope of operations research in industry and management.
- i. Differentiate between feasible and basic feasible solution.
- j. Name various elements of a queuing system.

Section B

(5 marks each)

- Q2. State the objectives and necessity of operations research.
- Q3. In a bank, 20 customers on the average, are served by a cashier in an hour. If the service time has exponential distribution, what is the probability that (a) It will take more the 10 minutes to serve a customer? (b) A customer shall be free within 4 minutes?
- Q4. Find the critical path for the network constituted as per the following project schedule.

Activity	Time (Weeks)	Activity	Time (Weeks)
1-2	4	5-6	4
1-3	1	5-7	8
2-4	1	6-8	1
3-4	1	7-8	2
3-5	6	8-10	5
4-9	5	9-10	7

- Q5. The time estimates for the activities of a PERT network are given below. Find the probability that the project will be completed at least 4 weeks earlier than the expected time.

Activity	t_o (Weeks)	t_m (Weeks)	t_p (Weeks)
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8

2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

Q6. Using graphical method, find the maximum value of 'Z' based on the following

$$\text{Maximize } Z = 2X_1 + X_2 ;$$

subject to the following constraints

$$X_1 + 2X_2 \leq 10 ;$$

$$X_1 + X_2 \leq 6 ;$$

$$X_1 - X_2 \leq 2 ;$$

$$X_1 - 2X_2 \leq 1 ;$$

$$X_1, X_2 \geq 0$$

Section C

(10 marks each)

Q7. Use simplex method to solve the following problem:

$$\text{Maximize } Z = 2X_1 + 5X_2 ;$$

$$\text{Subject to } X_1 + 4X_2 \leq 24 ;$$

$$3X_1 + X_2 \leq 21 ;$$

$$X_1 + X_2 \leq 9 ;$$

$$X_1, X_2 \geq 0$$

Q8. Find the optimum solution to the following transportation problem for minimization of the total cost of transportation of milk from three plants to four distribution centres. The cost (in rupees) of shipping milk from plants to destination centres along with supply (in litres) from each plant & requirement (in litres) of each distribution centres is given in the following table.

		Distribution Centres (Destinations)				Supply (Litres)
		1	2	3	4	
Plants (Origins)	1	2	3	11	7	6
	2	1	0	6	1	1
	3	5	8	15	9	10
Requirement (Litres)		7	5	3	2	17 (Total)

Q9. Four different jobs can be produced on four different machines. The set-up and take-down time costs are assumed to be prohibitively high for changeovers. The matrix below gives the cost in rupees of producing job 'I' on machine 'J'. Find, how should the Jobs be assigned to the various machines so that the total cost is minimized?

		Machines			
		M1	M2	M3	M4
Jobs	J1	5	7	11	6

_____	J2	8	5	9	6
	J3	4	7	10	7
	J4	10	4	8	3