

Sr. No.....

Dec 2018

B.Tech., VIII SEMESTER

Operations Research (MU-408)

Time: 3 Hours

Max. Marks:60

- Instructions:**
1. It is compulsory to answer all the questions (2 marks each) of Part -A in short.
  2. Answer any four questions from Part -B in detail.
  3. Different sub-parts of a question are to be attempted adjacent to each other.

**PART -A**

- Q1 (a) Define Operations Research. (2)
- (b) State any two limitations of OR. (2)
- (c) What is duality in LPP? (2)
- (d) What is degeneracy in transportation problem? (2)
- (e) Define balking and jockeying w.r.t. queuing system. (2)
- (f) What do you understand by parameters M/M/1 in a queuing system? (2)
- (g) What do you understand by crashing of network? (2)
- (h) Compare 'decision under risk' and 'decision under uncertainty' in decision theory. (2)
- (i) What is Laplace criterion in decision analysis? (2)
- (j) Describe any one method of random number generation. (2)

**PART -B**

- Q2 What is the importance of OR in decision-making process? Discuss the applications of OR in industry. (10)
- Q3 Solve following LP problem. (10)
- Max.  $Z = 3x_1 + 2x_2 + 5x_3$
- subject to  $x_1 + 2x_2 + x_3 \leq 430$
- $3x_1 + 2x_3 \leq 460$
- $x_1 + 4x_3 \leq 420$
- and  $x_1, x_2, x_3 \geq 0$ .
- Q4 Arrivals at telephone booth are considered to be Poisson with an average time (10)
- of 10 min. between one arrival and the next. The length of phone call is assumed to be distributed exponentially with mean 3 min.
- (a) What is the probability that a person arriving at the booth will have to wait?
- (b) What is the average length of the queue that forms from time to time?
- (c) What is the average number of customers in the system?
- (d) The probability that an arrival finds that four persons are waiting for their turn?

- Q5 Find the optimal solution to the following transportation problem for the cost matrix. Use Vogel's Approximation Method to obtain an initial basic feasible solution. (10)

	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>	Capacity
F <sub>1</sub>	19	30	50	10	7
F <sub>2</sub>	70	30	40	60	9
F <sub>3</sub>	40	8	70	20	18
Requirement	5	8	7	14	

- Q6 A project consists of certain activities whose time required for each activity is given in the following table. (10)

Activity	1-2	1-4	1-7	2-3	3-6	4-5	4-8	5-6	6-9	7-9	8-9
Time	2	2	1	4	1	5	8	4	3	3	5

- Draw network diagram for the project.
- Find the critical path and the project completion time.
- Calculate the earliest start and finish time, latest start and finish time for each activity.
- Calculate total float, free float and independent float of each activity.

- Q7 A company manufactures 30 units per day. The sale of these items depends upon demand which has the following distribution: (10)

Sales (Units)	Probability
27	0.10
28	0.15
29	0.20
30	0.35
31	0.15
32	0.05

The production cost and sale price of each unit are Rs 40 and Rs 50, respectively. Any unsold product is to be disposed off at a loss of Rs 15 per unit. There is a penalty of Rs 5 per unit if the demand is not met. Using the following random numbers, estimate the total profit/loss for the company for the next ten days: 10, 99, 65, 99, 95, 01, 79, 11, 16, 20. If the company decides to produce 29 units per day, what is the advantage or disadvantage to the company?

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