(i) Printed Pages: 4   Roll No. ....

(ii) Questions   : 10   Sub. Code : | 2 | 6 | 1 | 8 | 3 |

Exam. Code : | 0 | 5 | 0 | 2 |

Master of Commerce 2nd Semester

(2055)

OPERATIONS RESEARCH

(Same for USOL Candidates)

Paper—M.C. 205

Time Allowed : Three Hours]   [Maximum Marks : 80

Note :—Attempt **FIVE** questions in all, taking at least **ONE** question from each unit.

UNIT—I

1. (a) Discuss the significance and scope of Operations Research (OR) in decision making. Give the limitations of OR approach, if any.

   (b) Solve the following linear programming problem graphically :

   $x_1 + x_2 \le 6$, $x_1 - x_2 \le 2$ $x_1 \le 3$, $x_2 \le 6$ $(x_1, x_2 \ge 0)$.

   8,8

2. Consider the following linear programming problem :

   max $z = 3x_1 + 2x_2$

   st $3x_1 + x_2 \le 40$

   $x_1 + x_2 \le 20$

   $5x_1 + 3x_2 \le 90$

   $(x_1, x_2 \ge 0)$

   Solve the dual of this problem using the dual simplex method.

   8,8

3. (a) Give the mathematical and economic structure of Linear Programming Problems (LPPs). What is the difference between optimal solution and feasible solution of a LPP ?

(b) Solve the following linear programming problem using Big-M method :

$$\max z = 5x_1 - x_2$$

$$\text{st} \quad 2x_1 + x_2 = 6$$

$$x_1 + x_2 \le 4$$

$$x_2 \le 3$$

$$x_1, x_2 \ge 0 \qquad \qquad 8,8$$

UNIT—II

4. The processing time in hours for the jobs (J1 to J5) when allocated to different machines (M1 to M5) is indicated below. Assign the machines for the jobs so that the total processing time is minimum.

		Machines				
		M1	M2	M3	M4	M5
	J1	9	22	58	11	19
	J2	43	78	72	50	63
Jobs	J3	41	28	91	37	45
	J4	74	42	27	49	39
	J5	36	11	57	22	25	16

5. Solve the following transportation problem using Vogel's Approximation Method and perform optimality test using MODI method :

Origin/Destination	D1	D2	D3	D4	Supply
O1	11	13	17	14	250
O2	16	18	14	10	300
O3	21	24	13	10	400
Demand	200	225	275	250	950

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UNIT—III

6. A small project is composed of seven activities whose time estimates in weeks are given below. Draw the network and find the critical path. What is the probability that the project will be completed at least four weeks earlier than expected ?

Activity	1 – 2	1 – 3	1 – 4	2 – 5	3 – 5	4 – 6	5 – 6
Optimistic time	1	1	2	1	2	2	3
Most likely time	1	4	2	1	5	5	6
Pessimistic time	7	7	8	1	14	8	15

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7. What is a replacement problem ? State the conditions under which group replacement is superior to individual replacement. The following table gives the running costs per year and resale price of certain machine, whose purchase price is Rs. 50,000.

Year	1	2	3	4	5	6	7	8
Running cost (in 1000)	15	16	18	21	25	29	43	40
Resale value (in 1000)	35	25	17	12	8	5	5	5

In what year is the replacement due ?

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8. What is simulation ? State its advantages over mathematical model. Explain various phases of simulation. Explain the technique of Monte-Carlo Simulation by taking examples.   16

9. In a telephone booth, the arrivals follow Poisson distribution with an average of 9 minutes between two consecutive arrivals. The duration of a telephone call is exponential with an average of 3 min.

   (a) Find the probability that a person arriving at the booth has to wait.

   (b) Find the average queue length.

   (c) Find the fraction of the day, the phone will be in use.

   (d) The company will install a second booth if a customer has to wait for phone, for at least 4 minutes. If so, find the increase in the flow of arrivals in order that another booth will be installed. $4 \times 4 = 16$

10. What is game theory ? What are the properties of a Game ? Solve the following game by dominance principle :

		Strategies (Player B)			
		B1	B2	B3	B4
Strategies (Player A)	A1	19	6	7	5
	A2	7	3	14	6
	A3	12	8	18	4
	A4	8	7	13	−1

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