MBA (4th Semester) Examinations, June 2021 (CBCS) (DDE)
[Session: July 2019 - June 2021]

Subject: Operations Research
Paper: MBA-4803

Time: 3 Hours **Full Marks: 80**

The figures in the margin indicate full marks.

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

Group - A

Answer any six questions. 5×6=30

1. (a) What was the title of the first paper of Dantzig?
   (b) Who coined term Linear Programing (LP) and when?
   (c) In which year, the work of Kantorovich published?
   (d) Who proposed Transportation problem and when?
   (e) What is the name of first journal on Operations Research?
2. Name any five nature-based optimization techniques. Draw a schematic diagram showing the different methods of classical optimization.
3. What are slack, surplus and artificial variables? Why are these variables added to the constraints of Linear Programming?
4. Why do you choose the corner points of a feasible region as the candidates for finding optimal solution?
5. Define infeasible and unbounded solutions of Linear Programming with graphical example for each.
6. How would you solve a Transportation problem if you are given a profit matrix instead of a cost matrix? How would you convert an unbalanced Transportation problem to a balanced one? Explain it by examples.
7. (a) Write the Linear Programming formulation for Assignment problem.
   (b) What is Fulkerson' rule? Explain with an example.
8. (a) List out any five Simulation softwares.
   (b) List out any five Continuous Probability Distributions.

Group -B

Answer any five questions. 10×5=50

9. An automobile manufacturer makes automobiles and trucks in a factory that is divided into two shops. Shop 1, which performs the basic assembly operation, must work 5 man-days on each truck but only 2 man-days on each automobile. Shop 2, which performs finishing operations, must work 3 man-days on each automobile or truck that it produces. Because of men and machine limitations Shop 1 has 180 man-days per week available while Shop 2 has 135 man-days per week. If the manufacturer makes a profit of $300 on each truck and $200 on each automobile, how many of each should he produce to maximize his profit? You need to formulate the problem and solve the problem graphically.

10. Solve and find the alternate solutions for the following Linear Programing Problem:

Maximize $Z = x_1 + 2x_2 + 3x_3$

Subject to the constraints:

$x_1 + 2x_2 + 3x_3 \leq 10$

$x_1 + 2x_2 \leq 5$

$x_1, x_2, x_3 \geq 0$

11. Find the feasible solution for the following Transportation matrix by using: a) North-West Corner Method; b) Least Cost Method; c) VAM:

	D1	D2	D3	D4	Availability
O1	11	13	17	14	250
O2	16	18	14	10	300
O3	21	24	13	10	400
Demand	200	225	275	250	

12. Solve the following Assignment Problem:

		Tasks			
		E	F	G	H
Machines	A	18	26	17	11
	B	13	28	14	26
	C	38	19	18	15
	D	19	26	24	10

13. A retailer wants to forecast the possible sales of a particular health drinks for the next 15 days. Based on the historical demand for the product, the retailer has calculated the probability of its sales which is shown in the following table:

Demand	0	10	20	30	40	50	60	70	80	90
Probability	0.1	0.2	0.35	0.23	0.12	0.11	0.8	0.4	0.3	0.1

Use the following random numbers in order to generate a forecast for the health drinks for the next 15 days:

4, 51, 43, 84, 93, 52, 65, 25, 20, 89, 69, 40, 32, 75, 35

14. Based on the following table of data, draw the network, find the earliest and latest event times, identify the critical path and mention the project duration:

Activity	Optimistic Time (t_o)	Most Likely Time (t_m)	Pessimistic Time (t_p)
A (1 – 2)	1	2	3
B (1 – 3)	1	4	7
C (2 – 5)	2	4	6
D (3 – 4)	4	5	9
E (5 – 7)	3	4	5
F (4 – 6)	6	8	10
G (7 – 8)	3	3	6
H (6 – 8)	8	9	13
I (8 – 9)	6	9	12

15. (a) Briefly answer the following:
    (i) What is Jockeying?
    (ii) Mention any two Queue Disciplines.
    (iii) What is Memory Less property?
    (iv) Write out Little's Equation.
    (v) What is Kendall's notation?

    (b) Derive the expression for the probability that there is one customer in the system for a $M/M/1:\infty/\infty$ queue.