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Seventh Semester B.E. Degree Examination, Dec.2024/Jan.2025 Operations Research

Time: 3 hrs.

Max. Marks: 100

Note:1. Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define operations research and explain the characteristics of operation research. (06 Marks)
- b. A person has Rs.2500/- on hand. He wants to buy hens and sell the eggs as they hatch to make a profit. He finds out that old hens can be bought at Rs.100/- each and young hens can be bought at Rs.200/- each. The old hens lay 3 eggs per week and young ones lay 5 eggs per week each egg being worth Rs.10/-. It costs Rs.10/- per week to feed a old hen while for a young one it is Rs.18/-. Assuming that the person cannot house more than 20 hens, formulate this an linear programming model to maximize the profit. (14 Marks)

OR

- 2 a. Define the terms :
- (i) Feasible solution
 - (ii) Basic solution
 - (iii) Unbounded solution
 - (iv) Infeasible solution.
- b. Solve the following LPP using graphical method,
 Max $Z = 120x_1 + 100x_2$
 Subject to,
 $2x_1 + x_2 \leq 16$
 $x_1 + x_2 \leq 11$
 $x_1 + 2x_2 \geq 6$
 $5x_1 + 6x_2 \leq 90$
 $x_1, x_2 \geq 0$ (12 Marks)

Module-2

- 3 a. What is the significance of introducing slack, surplus and artificial variables in LPP. (04 Marks)
- b. Solve the following LPP using simplex method,
 Minimize $Z = x_1 - x_2 + 3x_3$
 Subject to,
 $3x_1 - x_2 + 3x_3 \leq 7$
 $-2x_1 + 4x_2 \leq 12$
 $-4x_1 + 3x_2 + 8x_3 \leq 10$
 $x_1, x_2, x_3 \geq 0$ (16 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 4 Solve the following problem using Big-M method,
Maximize

$$Z = x_1 + 2x_2 + 3x_3 - x_4$$

Subject to,

$$x_1 + 2x_2 + 3x_3 = 15$$

$$2x_1 + x_2 + 5x_3 = 20$$

$$x_1 + 2x_2 + x_3 + x_4 = 10$$

$$x_1, x_2, x_3, x_4 \geq 0$$

(20 Marks)

Module-3

- 5 a. What do you mean by balanced transportation problem? (04 Marks)
b. There are three factories A, B and C which supply goods to four dealers D_1, D_2, D_3 and D_4 . The production capacities of these factories are 1000, 700 and 900 units per month respectively. The requirements from the dealers are 900, 800, 500 and 400 units per month respectively. The per unit return (excluding transportation cost) are Rs.8, Rs.7 and Rs.9 at the three factories. The following table gives the unit transportation costs from the factories to the dealers.

	D_1	D_2	D_3	D_4
A	2	2	2	4
B	3	5	3	2
C	4	3	2	1

Determine the optimum solution to maximize the total returns.

(16 Marks)

OR

- 6 a. List the differences between transportation and assignment problems. (05 Marks)
b. Three buildings are to be added to the college campus. Bids are submitted by five contractors. The bid figures are given in millions of rupees and are as shown in table below:

Contractor \ Building	A	B	C
1	2.90	1.62	-
2	3.10	1.75	2.81
3	3.05	1.80	2.90
4	2.85	1.55	2.75
5	-	1.70	3.00

Find the assignment of buildings to contractors that will result in a minimum total cost for the building programme.

(15 Marks)

Module-4

- 7 a. Define the following :
(i) Event
(ii) Activity
(iii) Independent float.

(04 Marks)

- 7 b. A project consists of a series of tasks labelled A, B, C, D, E, F, G, H, I with following relationships ($W < X, Y$ means X and Y cannot start until W is completed). With this notation, construct the network diagram having the following constraints :
 $A < D, E$; $B, D < F$; $C < G$; $C < H$; $F, G < I$
 Find also the optimum times of completion of the project when the time (in days) of completion of each task is as follows :

Task	A	B	C	D	E	F	G	H	I
Duration (days)	23	8	20	16	24	18	19	4	10

Also calculate total float for each activities.

(16 Marks)

OR

- 8 The following table gives the activities and other relevant data of a project:

Activity	Time (days)		Cost (Rs.)	
	Normal	Crash	Normal	Crash
1 – 2	4	3	120	180
1 – 4	6	4	300	500
1 – 3	2	1	60	120
2 – 4	5	3	300	500
3 – 4	2	2	200	200
2 – 5	7	5	230	350
4 – 5	4	2	200	480

If indirect cost per day for project is Rs.100/-

- Draw the network diagram.
- Find the normal duration and cost of project.
- Find the optimum duration and cost.
- Crash the number of days to the maximum possible extent.

(20 Marks)

Module-5

- 9 a. Define saddle point, strategy, pay-off matrix, Two person zero sum game. (08 Marks)
 b. Two players A and B each have 1, 2 and 5 rupee coin. Each player randomly picks up a coin, if the sum of coins is even, A wins B's coin and if the sum of the coins is odd, B wins A's coin. Formulate the payoff matrix for the above game and find the optimum strategies for both the players and the value of the game. (12 Marks)

OR

- 10 a. State assumptions made while applying Johnson's rule to 'n' jobs on 2 machines. (06 Marks)
 b. Find the sequence for the following eight jobs, that minimizes the total elapsed time for completion of all jobs, each job being processed in the order CAB. Find the total elapsed time and idle time of each machine.

		Jobs							
		1	2	3	4	5	6	7	8
Machine	A	4	6	7	4	5	3	6	2
	B	8	10	7	8	11	8	9	13
	C	5	6	2	3	4	9	15	11

(14 Marks)
