CBCS SCHEME

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15CS653

Sixth Semester B.E. Degree Examination, Aug./Sept.2020
Operation Research

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. What is an Operation Research? Explain the phases of OR. **(08 Marks)**

b. A farmer has to plant two kinds of trees P and Q in a land of 4400sq.m area. Each P tree requires at least 15sq.m and Q tree requires 30sq.m area. The annual water requirement of P tree is 30 units and Q tree requires 20 units. A maximum of 3300 units of water is available annually. It is also estimated that the ratio of number of Q trees to the number of P trees should not be less than 6/19 and not more than 17/8. The return per tree from P is expected to be one and half times as much as from Q tree. Formulate the problem as a LP model. **(06 Marks)**

c. Define the following terms: i) Feasible solution ii) Optimal solution. **(02 Marks)**

OR

2 a. Explain the assumptions of simplex method. **(06 Marks)**

b. Use graphical method and solve following problem:

Maximize $Z = 6x_1 + 5x_2$

Subject to $x_1 + x_2 \leq 5$

$3x_1 + 2x_2 \leq 12$

$x_1, x_2 \geq 0$ **(06 Marks)**

c. Define the following terms with an example: i) Slack variable ii) Surplus variable. **(04 Marks)**

Module-2

3 a. Explain the general formulations of the LPP. **(06 Marks)**

b. Using simplex method, solve the following:

Maximize $Z = 4x_1 + 3x_2 + 6x_3$

Subject to $2x_1 + 3x_2 + 2x_3 \leq 440$

$4x_1 + 3x_3 \leq 470$

$2x_1 + 5x_2 \leq 430$

where $x_1, x_2, x_3 \geq 0$ **(10 Marks)**

OR

4 a. Mention the basic steps of Big-M method. **(04 Marks)**

b. Solve the following LPP using two-phase method

Maximize $Z = -4x_1 - 3x_2 - 9x_3$

Subject to $2x_1 + 4x_2 + 6x_3 \geq 15$

$6x_1 + x_2 + 6x_3 \geq 12$

where $x_1, x_2, x_3 \geq 0$ **(12 Marks)**

Module-3

5 a. What is duality? Explain the relationships between the primal and the dual problems. **(08 Marks)**

b. Obtain the dual of the following primal problem:

Maximize $Z = 5x_1 + 6x_2$

Subject to $x_1 + 2x_2 = 5$

$-x_1 + 5x_2 \geq 3$

x is unrestricted, $x_2 \geq 0$ **(08 Marks)**

OR

6 a. Write any 6 key relationship between primal to dual problems. **(06 Marks)**

b. Find the dual of the following LPP, solve the dual and hence find the solution to the primal

Minimize $Z = 2x_1 + 0x_2 + x_3$

Subject to $x_1 + x_2 - x_3 \geq 5$

$x_1 - 2x_2 + 4x_3 \geq 8$

where $x_1, x_2, x_3 \geq 0$ **(10 Marks)**

Module-4

7 a. Find the initial basic feasible solution for the following problem, and also find the transportation cost using North West Corner Rule.

					Supply
	4	6	8	8	40
	6	10	6	7	60
	5	7	6	8	50
Demand	20	30	50	50	

(05 Marks)

b. Write the procedure of Vogel's approximation method. **(06 Marks)**

c. Solve the following problem using Vogel's approximation method:

					Supply
	4	6	8	8	40
	6	8	6	7	60
	5	7	6	8	50
Demand	20	30	50	50	

(05 Marks)

OR

8 a. Three jobs are to be done by 4 machines: Each job can be assigned to one and only one machine. The cost of each job on each machine is given in the following table:

		Machine			
		M_1	M_2	M_3	M_4
Job	J_1	18	24	28	32
	J_2	8	13	17	19
	J_3	10	15	15	22

What are the job assignments which will minimize the total cost? **(08 Marks)**

b. Obtain the optimum solution for the given problem using MODI method.

2	3	11	7	6
1	0	6	1	1
5	8	15	9	10
7	5	3	2	

(08 Marks)

Module-5

9 a. What is a saddle point? Give an example. **(04 Marks)**

b. Explain the maximin-minimax principle. Give an example. **(06 Marks)**

c. Solve the following game, determine the optimum strategies and value of the game:

8	-3
-3	1

(06 Marks)

OR

10 Write the short note on the following:

a. Metaheuristics

b. Tabu search

c. Simulated Annealling

d. Genetic Algorithms. **(16 Marks)**

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