CBCS SCHEME

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15CS653

Sixth Semester B.E. Degree Examination, Jan./Feb. 2021
Operations 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 operations research? Briefly explain the various phases of operations research study. **(08 Marks)**

b. A person requires minimum 10, 12 and 12 units of chemicals for A, B and C respectively for his garden. A liquid product contain 5, 2 and 1 units of A, B and C respectively per Jar. A dry product contains 1, 2 and 4 units of A, B and C per jar. If the liquid product sells for Rs.3 per jar and dry product sells for Rs.2 per jar, how many of each should be purchased in order to minimize the cost and meet requirement. **(08 Marks)**

OR

2 a. Briefly explain the assumptions of linear programming. **(04 Marks)**

b. Use Graphical method to solve the following:

Maximize $Z = 100x_1 + 40x_2$

Subject to $5x_1 + 2x_2 \le 1000$

$3x_1 + 2x_2 \le 900$

$x_1 + 2x_2 \le 500$

$x_1, x_2 \ge 0$ **(07 Marks)**

c. Mention the advantages and limitations of L.P. **(05 Marks)**

Module-2

3 a. Define the terms:

(i) Feasible solution (ii) Feasible region

(iii) Optimal solution (iv) Unbound solution **(04 Marks)**

b. Explain the steps involved in setting up of a Simplex method. **(08 Marks)**

c. Define and illustrate with examples slack variables and surplus variables. **(04 Marks)**

OR

4 a. Solve the following LPP by using Big-M method.

Maximize $Z = -2x_1 - x_2$

Subjected to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \ge 6$

$x_1 + 2x_2 \le 4$

$x_1, x_2 \ge 0$ **(08 Marks)**

b. Solve the following LPP by using two phase method:

Maximize $Z = 5x_1 + 8x_2$

Subjected to $3x_1 + 2x_2 \ge 3$

$x_1 + 4x_2 \ge 4$

$x_1 + x_2 \le 5$

$x_1, x_2 \ge 0$ **(08 Marks)**

Module-3

5 a. Explain two phase technique to solve in Simplex methods. **(08 Marks)**

b. Write 5 key relationship between the primal and the dual problems. **(05 Marks)**

c. Write the dual of the following LPP:

Maximize $Z = 7x_1 + 4x_2 + 5x_3$

Subject to the constraints $2x_1 + 4x_2 + 3x_3 \leq 10$

$x_1 + 3x_2 + x_3 \leq 6$

and $x_1, x_2, x_3 \geq 0$ **(03 Marks)**

OR

6 a. Explain the essence of duality theory. **(05 Marks)**

b. Write the dual of the following LPP.

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

Subject to the constraints $2x_1 - 3x_2 + x_3 \leq 5$

$4x_1 - 2x_2 \geq 9$

$-8x_1 + 4x_2 + 3x_3 = 8$

and $x_1, x_2 \geq 0$, x_3 is unrestricted **(03 Marks)**

c. Solve the following LPP by using dual simplex method.

Minimize $Z = 10x_1 + 6x_2 + 2x_3$

Subject to $-x_1 + x_2 + x_3 \geq 1$

$3x_1 + x_2 - x_3 \geq 2$

and $x_1, x_2, x_3 \geq 0$ **(08 Marks)**

Module-4

7 a. Find the initial solution to the following transportation problem using VAM. **(08 Marks)**

Destination

		D_1	D_2	D_3	D_4	Supply
Factory	F_1	3	3	4	1	100
	F_2	4	2	4	2	125
	F_3	1	5	3	2	75
	Demand	20	80	75	25	300

b. Explain different steps in Hungarian algorithm to solve an assignment problem. **(08 Marks)**

OR

8 a. Solve the following assignment problem. **(08 Marks)**

Machines

		M_1	M_2	M_3	M_4	M_5
Jobs	J_1	11	17	8	16	20
	J_2	9	7	12	6	15
	J_3	13	16	15	12	16
	J_4	21	24	17	28	26
	J_5	14	19	12	11	13

b. Find the optimal transportation cost of the following matrix by using lest cost method.

	A	B	C	D	E	Supply
P	4	1	2	6	9	100
Q	6	4	3	5	7	120
R	5	2	6	4	8	120
Demand	40	50	70	90	90	

(08 Marks)

Module-5

9 a. Solve the game whose pay off matrix is given by **(04 Marks)**

B \ A	I	II	III
I	2	–1	8
II	–4	–3	4
III	–8	–4	0
IV	1	–6	–2

b. Explain the following:
(i) Minimax and maximin principles
(ii) Pure and mixed strategies
(iii) Two person zero sum game
(iv) Dominance principles **(12 Marks)**

OR

10 Write short notes on:
a. Metaheuristics
b. Tabu search algorithm
c. Simulated Annealing algorithm
d. Genetic Algorithm **(16 Marks)**

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