CBCS SCHEME

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15CS653

Sixth Semester B.E. Degree Examination, June/July 2024
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. Find all the basic solutions of the following problem :

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

Subject to constraints $x_1 + 2x_2 + 3x_3 = 4$

$2x_1 + 3x_2 + 5x_3 = 7$

Also find which of the basic solution are :

i) basic feasible ii) non–degenerate basic feasible iii) optimal basic feasible. **(06 Marks)**

b. Solve the following LPP by Big-M method.

Maximize $Z = -2x_1 - x_2$

Subject to constraints $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 4$

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

OR

4 a. Solve the following LPP by simplex method.

Maximize $= 3x_1 + 2x_2$

Subject to constrains $x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 4$

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

b. Solve the following LPP by two-phase simplex method.
Maximize $z = 3x_1 - x_2$
Subject to constraints $2x_1 + x_2 \geq 2$
$x_1 + 3x_2 \leq 2$
$x_2 \leq 4$
and $x_1, x_2 \geq 0$ **(08 Marks)**

Module-3

5 a. Explain Primal dual relationship in mathematical form. **(08 Marks)**

b. Obtain the dual problem of the following primal LP problem.
Maximize $z = 40x_1 + 120x_2$
Subject to the constraints $x_1 - 2x_2 \leq 8$,
$3x_1 + 5x_2 = 90$,
$15x_1 + 44x_2 \leq 660$,
$x_1 \geq 0,\ x_2 \geq 0$. **(08 Marks)**

OR

6 a. Define dual simplex method. Explain the procedure of dual simplex method. **(08 Marks)**

b. Use dual simplex method to solve the following problem:
Maximize $z = -2x_1 - 3x_2$
Subject to the constraints $x_1 + x_2 \geq 2$,
$2x_1 + x_2 \leq 10$ and
$x_1 + x_2 \leq 8$,
with x_1 and x_2 non negative. **(08 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:

Job	Machine M_1	M_2	M_3	M_4
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. Define : i) pure strategy ii) mixed strategy iii) optimal strategy. **(06 Marks)**

b. Solve the following game by dominance principle.

Player A	Player B B_1	B_2	B_3	B_4
A_1	3	2	4	0
A_2	3	4	2	4
A_3	4	2	4	0
A_4	0	4	0	8

(10 Marks)

OR

10 a. Solve the following game by graphical method. **(06 Marks)**

Player A	Player B I	II	III	IV	V
I	2	–1	5	–2	6
II	–2	4	–3	1	0

b. Write short notes on :
i) Genetic algorithm
ii) Tabu search algorithm. **(10 Marks)**

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