CBCS SCHEME

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15CS653

Sixth Semester B.E. Degree Examination, June/July 2019
Operation Research

Time: 3 hrs. Max. Marks: 80

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

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.

Module-1

1 a. Define operation research. List and explain the various phases of an operation research study. **(08 Marks)**

b. A firm manufactures three products A, B and C. The profits per unit product are Rs.3, Rs.2 and Rs.4 respectively. The firm has two machines and the required processing time in minutes for each machine on each product is given below :

	Product		
Machine	A	B	C
X	4	3	5
Y	2	2	4

Machines X and Y have 2000 and 1500 machine-minutes respectively. The firm must manufacture 100A's, 200B's and 50C's but not more than 150A's. Set up an LP model to maximize the profit. **(08 Marks)**

OR

2 a. Use the graphical method to solve the following LPP :

Maximize $Z = x + 0.5y$

Subject to constraints $3x + 2y \leq 12$

$5x \leq 10$

$x + y \leq 18$

$-x + y \geq 4$

where $x, y \geq 0$. **(12 Marks)**

b. Define : i) Feasible solution ii) unbounded solution iii) Fesible region iv) Optimal solution. **(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 $x_1 + x_2 \le 4$
$x_1 - x_2 \le 4$
and $x_1, x_2 \ge 0$. (08 Marks)

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

Module-3

5 a. Write applications of dual simplex method. (06 Marks)

b. Solve by dual simplex method the following problem :
Maximize $z = 2x_1 + 2x_2 + 4x_3$
Subject to constraints $2x_1 + 3x_2 + 5x_3 \ge 2$
$3x_1 + x_2 + 7x_3 \le 3$
$x_1 + 4x_2 + 6x_3 \le 5$
$x_1, x_2, x_3 \ge 0$. (10 Marks)

OR

6 a. Construct the dual of the problem :
i) minimize $z = 3x_1 - 2x_2 + 4x_3$
subject to constraints $3x_1 + 5x_2 + 4x_3 \ge 7$
$6x_1 + x_2 + 3x_3 \ge 4$
$7x_1 - 2x_2 - x_3 \le 10$
$x_1 - 2x_2 + 5x_3 \ge 3$
$4x_1 + 7x_2 - 2x_3 \ge 2$
and $x_1, x_2, x_3 \ge 0$. (05 Marks)

ii) maximize $z = 3x_1 + 5x_2$
subject to constraints $2x_1 + 6x_2 \le 50$
$3x_1 + 2x_2 \le 35$
$5x_1 - 3x_2 \le 10$
$x_2 \le 20$
where $x_1, x_2 \ge 0$. (05 Marks)

b. What are the advantages of duality property? (06 Marks)

Module-4

7 a. Find the initial basic feasible solution by using North–West corner rule. (06 Marks)

	D_1	D_2	D_3	D_4	Supply
O_1	1	5	3	3	34
O_2	3	3	1	2	15
O_3	0	2	2	3	12
O_4	2	7	2	4	19
Demand	21	25	17	17	80

b. Find the initial basic feasible solution using Vogel's approximation method. (10 Marks)

	W_1	W_2	W_3	W_4	Availability
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Requirement	5	8	7	14	

OR

8 a. Solve by matrix minima method and obtain an optimal solution for the following problem:

				Available
From	50	30	220	1
	90	45	170	3
	250	200	50	4
Required	4	2	2	

(10 Marks)

b. Solve the following assignment problem :

	J_1	J_2	J_3	J_4
A	2	10	9	7
B	15	4	14	8
C	13	14	16	11
D	3	15	13	8

(06 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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