CBCS SCHEME

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15CS653

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Define operations research. Explain the six major phases of operations research. **(08 Marks)**

b. Solve the Linear programming problem graphically.

$Z_{max} = 20x_1 + 24x_2$

Subject to : $2x_1 + 3x_2 \leq 1500$

$3x_1 + 2x_2 \leq 1500$

$x_2 \leq 450$ and

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

OR

2 a. Old hens can be bought at Rs.50 –each but young ones cost Rs.100 each. The old hens lay 3 eggs/week and young hens 5 eggs/week. Each egg costs Rs.2. A hen costs Rs. 5 per week to feed. If a person has only Rs. 2000 to spend for hens, formulate the problem to decide how many of each kind of hen should he buy? Assume that he cannot house more than 40 hens. **(08 Marks)**

b. With reference to Linear Programming Problem (LLP) define the following :
i) Feasible solution ii) Unbounded solution iii) Optimal solution iv) Feasible region. **(08 Marks)**

Module-2

3 a. Use simplex method to solve the following LPP (Linear Programming Problem).

Max $z = 3x_1 + 9x_2$

Subject to $x_1 + 4x_2 \leq 8$

$x_1 + 2x_2 \leq 4$ and

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

b. Solve using penalty method (Big–M)

Max $Z = 3x_1 - x_2$

Subject to : $2x_1 + x_2 \geq 2$

$x_1 + 3x_2 \leq 3$

$x_2 \leq 4$ and

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

OR

4 a. Obtain all the basic solutions for the system of linear equations :

$2x_1 + x_2 + 4x_3 = 11$

$3x_1 + x_2 + 5x_3 = 14$. **(06 Marks)**

b. Use two phase simplex method to solve the following LPP.

Max $z = 5x_1 - 4x_2 + 3x_3$

Subject to $2x_1 + x_2 - 6x_3 = 20$

$6x_1 + 5x_2 + 10x_3 \leq 76$

$8x_1 - 3x_2 + 6x_3 \leq 50$ and

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

Module-3

5 a. Write the dual of the following primal LPP.

Max $z = 3x_1 - x_2 + x_3$

Subject to : $4x_1 - x_2 \le 8$

$8x_1 + x_2 + 3x_3 \ge 12$

$5x_1 - 6x_3 \le 13$

$x_1, x_2, x_3 \ge 0.$ **(08 Marks)**

b. Use dual Simplex method to solve the following LPP :

Max $z = -3x_1 - x_2$

Subject to : $x_1 + x_2 \ge 1$

$2x_1 + 3x_2 \ge 2$

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

OR

6 a. List out the procedural steps used to solve a LPP using dual simplex method. **(08 Marks)**

b. Explain briefly the essence of duality theory with an example. **(08 Marks)**

Module-4

7 a. Determine an initial basic feasible solution to the following transportation problem using North West Corner's rule. **(05 Marks)**

O/D	D_1	D_2	D_3	D_4	Supply
01	6	4	1	5	14
02	8	9	2	7	16
03	4	3	6	2	5
Required	6	10	15	4	35

b. Four jobs are to be done on four different machines. The cost [in rupees] of producing i^{th} job on j^{th} machine is given below :

Jobs \ Machine	M_1	M_2	M_3	M_4
J_1	15	11	13	15
J_2	17	12	12	13
J_3	14	15	10	14
J_4	16	13	11	17

Assign the jobs to different machine so as to minimize the total cost. **(06 Marks)**

c. Find an initial basic feasible solution for the following transportation problem using least cost or matrix minima method :

19	30	50	10	7
70	30	40	60	9
40	80	70	20	18
5	8	7	14	

(05 Marks)

OR

8 a. Determine the optimum basic feasible solution for the following transportation problem. Obtain initial basic feasible by vogels approximation method. **(08 Marks)**

O/D	D_1	D_2	D_3	D_4	Supply
01	2	2	2	1	3
02	10	8	5	4	7
03	7	6	6	8	5
Demand	04	3	4	4	

b. Solve the following assignment problem. If it is treated as a salesman problem and the cell entries represent cost in rupees. Find the least cost route such that salesman does not visit any city twice.

	A	B	C	D	E
A	∞	2	5	7	1
B	6	∞	3	8	2
C	8	7	∞	4	7
D	12	4	6	∞	5
E	1	3	2	8	∞

(08 Marks)

Module-5

9 a. Solve the game using principle of dominance method whose payoff matrix to the player – A is given in the table. **(08 Marks)**

		Player – B		
		I	II	III
Player – B	I	1	7	2
	II	6	2	7
	III	5	2	6

b. Give a note on basic simulated annealing algorithm and basic genetic algorithm. **(08 Marks)**

OR

10 a. Solve the following game graphically. **(08 Marks)**

		Player–B		
		B_1	B_2	B_3
Player–A	A_1	2	6	22
	A_2	16	10	4

b. Explain briefly the nature of metaheurstics. **(05 Marks)**

c. Find the value of the game :

$$P_1 \begin{matrix} & P_2 \\ & \begin{matrix} I & II \end{matrix} \\ \begin{matrix} I \\ II \end{matrix} & \begin{bmatrix} -4 & 6 \\ 2 & -3 \end{bmatrix} \end{matrix}$$

(03 Marks)

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