CBCS SCHEME

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15CS653

Sixth Semester B.E. Degree Examination, July/August 2021
Operations Research

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions.***

1 a. Define Operations Research. Explain the phases of operations research. **(06 Marks)**

b. A company has 2 grades of inspectors, I and II to undertake quality control inspection. Atleast 1500 pieces must be inspected in an 8 hour/day. Grade I inspector can check 20 pieces in an hour with an accuracy of 96% Grade II inspector checks 14 pieces an hour with an accuracy of 92%. Wages of Grade I inspector are Rs.5/hour while those of grade II inspector are Rs.4/hour. Any error made by an inspector costs Rs.3 to the company. If there are in all 10 Grade I inspectors and 15 Grade II inspectors in the company, find the optimal assignment of inspectors that minimizes the daily inspection cost. **(10 Marks)**

2 a. Briefly explain the working procedure of graphical method to solve a LPP. **(08 Marks)**

b. Solve the following LPP by graphical method:

Maximize $z = 2x_1 + x_2$

Subject to constraints $x_1 + 2x_2 \le 10$

$x_1 + x_2 \le 6$

$x_1 - x_2 \le 2$

$x_1 - 2x_2 \le 1$

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

3 a. Using simplex method solve the given LPP,

Maximize $Z = 12x_1 + 15x_2 + 14x_3$

Subject to constraints $-x_1 + x_2 \le 0$

$-x_2 + 2x_3 \le 0$

$x_1 + x_2 + x_3 \le 100,$

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

b. Briefly explain the steps involved in Big M method. **(06 Marks)**

4 a. Using Big-M method solve the given LPP,

Maximize $z = 6x_1 + 4x_2$

Subject to constraints, $2x_1 + 3x_2 \le 30,$

$3x_1 + 2x_2 \le 24,$

$x_1 + x_2 \ge 3,$

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

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

Minimize $z = 4x_1 + x_2$

Subject to constraints, $x_1 + 2x_2 \le 4,$

$4x_1 + 3x_2 \ge 6,$

$3x_1 + x_2 = 3$

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

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 $x_1 - 2x_2 \le 8$,

$3x_1 + 5x_2 = 90$,

$15x_1 + 44x_2 \le 660$,

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

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 $x_1 + x_2 \ge 2$,

$2x_1 + x_2 \le 10$ and

$x_1 + x_2 \le 8$,

with x_1 and x_2 non negative. (08 Marks)

7 a. A company is spending Rs.1000 everyday on transportation of its units from three plants to four distribution centers. The supply and demand units with unit cost of transportation are given as,

Distribution Center

Plant	D_1	D_2	D_3	D_4	Capacity↓
P_1	19	30	50	12	7
P_2	70	30	40	60	10
P_3	40	10	60	20	18
Demand→	5	8	7	15	

What can be the maximum savings to the company by optimum scheduling? (08 Marks)

b. There are three factories A, B and C supplying goods to four dealers D_1, D_2. D_3 and D_4. The production capacities of these factories are 1000, 700 and 900 units respectively. The requirements from the dealers are 900, 800, 500 and 400 units per month respectively. The per unit return (excluding transportation cost) are Rs.8, Rs.7 and Rs.9 at the three factories. The following table gives the unit transportation costs from the three factories to dealers. Determine the optimum solution to maximize the total returns. (08 Marks)

	D_1	D_2	D_3	D_4
A	2	2	2	4
B	3	5	3	2
C	4	3	2	1

8 a. Explain the procedure of Hungarian method. (05 Marks)

b. Solve the following assignment problem where the numbers of the matrix indicate cost: (03 Marks)

	A	B	C
1	12	11	8
2	8	9	11
3	11	14	12

c. Solve the following assignment problem which as follows:

The entries indicate the profits by assigning jobs to persons. Who will be the idle person?

	J_1	J_2	J_3	J_4
P_1	11	3	5	8
P_2	9	9	8	4
P_3	10	3	5	10
P_4	4	13	12	11
P_5	8	9	10	4

(08 Marks)

9 a. Using the dominance concept, obtain the optimal strategies for both the players and determine the value of the game. The pay off matrix for player A is given,

		B				
		I	II	III	IV	V
	I	2	4	3	8	4
A	II	5	6	3	7	8
	III	6	7	9	8	7
	IV	4	2	8	4	3

(08 Marks)

b. Solve the following game using graphical method:

	B_1	B_2
A_1	-6	7
A_2	4	-5
A_3	-1	-2
A_4	-2	5
A_5	7	-6

(08 Marks)

10 a. Briefly explain the following:
(i) Tabu search.
(ii) Genetic algorithm. **(08 Marks)**

b. In a game of matching coins, player 'A' wins Rs.8, if both coins show heads and Rs.1 if both are tails. Player 'B' wins Rs.3 when coins do not match. Given the choice of being Player 'A' or Player 'B', which would you choose and what would be your strategy? **(08 Marks)**

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