2020

COMPUTER SCIENCE — GENERAL

Paper : DSE-A-2

(Operation Research)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Day 3

Answer ***question no.*** **1** and ***any four*** questions from the rest.

1. Answer ***any five*** questions : 2×5

(a) Mention any two limitations of Operation Research.

(b) What do you understand by Degenerate solution?

(c) Write statement of weak duality theorem.

(d) When is a game called a fair game?

(e) Define primal problem.

(f) What is an assignment problem?

(g) What is a balanced transportation problem?

(h) State the limitations of graphical method.

2. (a) Using North-West corner rule obtain an initial basic feasible solution to the following transportation problem :

	D_1	D_2	D_3	D_4	Supply
O_1	1	2	3	4	6
O_2	4	3	2	0	8
O_3	0	2	2	1	10
Demand	4	6	8	6	

(b) Using matrix minima method obtain an initial basic feasible solution to the following transportation problem :

	D_1	D_2	D_3	D_4	Available
O_1	7	9	3	2	16
O_2	4	4	3	5	14
O_3	6	4	5	8	20
Require units	11	9	22	8	

5+5

3. (a) Solve the following assignment problem :

	A	B	C	D
I	1	4	6	3
II	9	7	10	9
III	4	5	11	7
IV	8	7	8	5

(b) Describe a method of drawing minimum number of lines in the context of assignment problem. Name the method. 5+(4+1)

4. (a) What is a game theory? What are the properties of a game?

(b) Solve the following 2×3 game :

	Player B		
Player A	1	3	11
	8	5	2

(2+3)+5

5. (a) Solve the following problem using graphical solution method.

Maximize $Z = 3x_1 + 2x_2$

Subject to the constraints :

$$\begin{aligned} -2x_1 + x_2 &\leqslant 1 \\ x_1 &\leqslant 2 \\ x_1 + x_2 &\geqslant 0. \end{aligned}$$

(b) Use the simplex method to solve the L.P.P.

Maximize $Z = 3x_1 + 2x_2$

Subject to the constraints :

$$\begin{aligned} x_1 + x_2 &\leqslant 4 \\ x_1 - x_2 &\leqslant 2 \\ x_1 , x_2 &\geqslant 0. \end{aligned}$$

5+5

6. (a) Obtain the dual problem of the following L.P.P.

Maximize $f(x) = 2x_1 + 5x_2 + 6x_3$

Subject to the constraints :

$$\begin{aligned} 5x_1 + 6x_2 - x_3 &\leqslant 3 \\ -2x_1 + x_2 + 4x_3 &\leqslant 4 \\ x_1 - 5x_2 + 3x_3 &\leqslant 1 \\ -3x_1 - 3x_2 + 7x_3 &\leqslant 6 \\ x_1, \quad x_2, \quad x_3 &\geqslant 0 \end{aligned}$$

(b) Use duality to solve the following L.P.P.

Minimize $Z = 15x_1 + 10x_2$

Subject to the constraints :

$$\begin{aligned} 3x_1 + 5x_2 &\geqslant 5 \\ 5x_1 + 2x_2 &\geqslant 3 \\ x_1 , x_2 &\geqslant 0. \end{aligned}$$

5+5

7. (a) What is unbalanced transportation problem? How do you start in this case?

(b) Solve the following transportation problem :

	A	B	C	Plant Supply
W	6	4	9	200
X	10	5	8	175
Y	12	7	6	75
Warehouse Demand	250	100	150	

(2+3)+5

8. (a) Show that the optimal solution of an assignment problem is unchanged if we add or subtract the same constant to the entries of any row or column of the cost matrix.

(b) How do you interpret an assignment problem as an Linear Programming model? 5+5