 PUBV(S-V) — BCA

(DSE – 1)

2024

Time : 3 hours

Full Marks : 70

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

The figures in the margin indicate full marks.

*Answer from **all** the Groups as directed.*

(Operations Research)

Group – A

1. Choose the correct answer of the following : 1×5 = 5

(a) Game theory models are classified by :

(i) Number of players

(ii) Sum of all playoffs

(iii) Number of strategies

(iv) All of these

(b) The feasible region of an LPP is a :

(i) Convex set

(ii) Non-convex set

(iii) Convexity of feasible region depends on the LPP

(iv) None of these

(c) The objective function of an LPP is a :

(i) Linear function

(ii) Non-linear function

(iii) Linearity of the objective function depend of the LPP

(iv) None of these

(d) What happens when maximin and minimax values of the game are same ?

(i) No solution exists

(ii) Solution is mixed

(iii) Saddle point exists

(iv) None of these

(e) The feasible solution of an LPP which gives the best value to the objective function is called :

(i) General solution

(ii) Optimal solution

(iii) Particular solution

(iv) None of these

$1 \times 5 = 5$

2. Fill in the blanks :

(a) Rank of a unit matrix I_5 is equal to _____.

(b) The region inside a square is an example of a _____ set.

(c) The Floyd algorithm is used to find _____.

(d) When the total demand is not equal to supply then the transportation problem is said to be _____.

(e) The set of constraints in an LPP identify the _____ region.

Group – B

(Short-answer Type Questions)

Answer any **four** questions of the following : $5 \times 4 = 20$

3. Solve the linear system :

   $x+y+z = 4,\ 3x - y - z = 2,\ x + 3y + 3z = 8.$

4. Find the rank of the matrix :

$$\begin{bmatrix} 1 & 2 & 1 \\ 5 & 1 & 0 \\ 3 & -1 & 1 \end{bmatrix}$$

5. Show that the intersection of two convex sets is also a convex set.

6. Solve the following 2 × 2 game :

Player B	**Strategy I**	**Strategy II**
Player A		
Strategy I	1	7
Strategy II	6	2

7. Write a short note on Fulkerson algorithm with an example.

8. Explain the differences between PERT and CPM with examples.

Group – C

(Long-answer Type Questions)

Answer any **four** questions of the following : $10 \times 4 = 40$

9. Solve by using simplex method :

   Max $Z = 5x_1 + 7x_2$

   Subject to the constraints

   $2x_1 + 3x_2 \leq 13$

   $3x_1 + 2x_2 \leq 12$

   Where $x_1, x_2 \geq 0.$

10. Solve the LPP graphically :

    Max $Z = 6x + 11y$

    Subject to the constraints

    $2x + 3y \leq 6$

    $x + 4y \leq 4$

    $x, y \geq 0.$

11. Obtain the initial basic feasible solution of the given transportation problem whose cost and requirement table is given below :

Destination	D_1	D_2	D_3	D_4	Supply
Origin					
O_1	6	4	1	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Demand	6	10	15	4	

12. Solve the Assignment problem using Hungarian method. Assign the jobs for different machines so as to minimize the total cost :

Machines	A	B	C	D	E
Jobs					
1	13	8	16	18	19
2	9	15	24	9	12
3	12	9	4	4	4
4	6	12	10	8	13
5	15	17	18	12	20

13. Write the augmented matrix and solve the linear system :

$x + y + z = 4$,

$3x - y - z = 2$,

$x + 3y + 3z = 8$.

14. Solve the following game using Principle of Dominance method :

Player B	Strategy I	Strategy II	Strategy III
Player A			
Strategy I	1	7	2
Strategy II	6	2	7
Strategy III	5	1	6