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Voc(S-V) — BCA

(DSE – 1)

2023

Time : 3 hours

Full Marks : 70

Pass Marks : 32

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.

Group – A

(Compulsory)

(Objective Type Questions)

1. Choose the correct option in each of the following : 1×5 = 5

(a) Least Cost method is connected with :

(i) Assignment problem

- (ii) ☒ Transportation problem
 - (iii) PERT
 - (iv) ☐ None of these
- (b) Game theory models are classified by :
- (i) Number of players
 - (ii) Sum of all play offs
 - (iii) Number of strategies
 - (iv) ☒ All of these
- (c) 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
- (d) PERT stand for :
- (i) Performance Evaluation Review Technique

(ii) Programme Evaluation Review
Technique

(iii) Programme Evaluation Research
Technique

(iv) None of these

(e) In a network diagram, activity is denoted by :

(i) Node

(ii) Arrow

(iii) Triangle

(iv) None of these

2. Fill in the blanks of the following : $1 \times 5 = 5$

(a) Rank of a unit matrix I_3 is equal
to 3.

(b) Every square matrix has a _____ row
canonical form.

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

(d) Key element is also known as _____ element.

(e) The number of time estimates involved in PERT problem is _____.

Group – B

(Short-answer Type Questions)

Answer any four questions of the following :

$$5 \times 4 = 20$$

3. Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 1 & 4 \\ 3 & 4 & 9 & 8 \\ -1 & 2 & -2 & 4 \end{bmatrix}$.

4. Determine whether the vectors are linearly independent or dependent?

$$v_1 = (1, 1, 1, -2)$$

$$v_2 = (3, 1, 1, 2)$$

$$v_3 = (1, 5, 1, 4)$$

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

5 ↑

6. Solve the following 2×2 game :

Player B	Strategy I	Strategy II
Player A		
Strategy I	4	2
Strategy II	6	8

$$\frac{32-12}{12-8} = \frac{20}{4} = 5$$

7. Explain PERT and CPM with examples.
8. Explain with examples of the following :
 - (a) Local and Global optima
 - (b) Extreme points

Group – C

(Long-answer Type Questions)

Answer any four questions of the following :

$$10 \times 4 = 40$$

9. Solve the LPP using simplex method :

$$\text{Max } Z = 5x_1 + 3x_2$$

$$\text{Subject to } x_1 + 2x_2 \leq 6$$

$$2x_1 + x_2 \leq 6$$

$$x_1, x_2 \geq 0$$

$$-1 \times \frac{10}{3}$$

$$\frac{7}{3}$$

$$-\frac{1}{2} \times \frac{2}{3}$$

$$2 - \frac{2}{3} = \frac{4}{3}$$

$$\frac{3+1}{6}$$

XH – 15/3

(5)

(Turn over)

22/3

$$\frac{1}{2} + \frac{1}{3} \times \frac{1}{2}$$

10. Solve the LPP graphically :

$$\text{Max } Z = 2x + 5y$$

$$\text{Subject to } x + 2y \leq 20$$

$$2x + y \leq 10$$

$$x, y \geq 0$$

11. Obtain the initial basic feasible solution of the given transportation problem by Vogel's Approximation method, whose cost and requirement table is given below :

Destination \ Origin	D ₁	D ₂	D ₃	D ₄	Supply
O ₁	11	13	17	14	250
O ₂	16	18	14	10	300
O ₃	21	24	13	10	400
Demand	200	225	275	250	

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

950

Machines Jobs	A	B	C	D
1	2	5	3	7
2	2	8	9	5
3	3	7	2	8
4	1	5	3	1

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

$$3x - 5y - 4z = -5$$

$$2x - y - 9z = -4$$

$$-3x + 6y + 7z = 3$$

14. Draw a network diagram to represent the project.

Also, identify the critical path :

Activity Predecessor Duration (in days)

A — 3

B A 4

Activity Predecessor Duration (in days)

C	A	2
D	B	5
E	C	1
F	C	2
G	D, E	4
H	F, G	3

