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## SECOND SEMESTER (CBCSS-UG) DEGREE EXAMINATION APRIL 2024

BCA

BCA 2C 04—OPERATIONS RESEARCH

(2019—2023 Admissions)

Time : Two Hours　　　　　　　　　　　　　　　　　　　Maximum : 60 Marks

### Section A (Short Answer Type Questions)

*Answer* **all** *questions.*
*Each question carries 2 marks.*
*Ceiling 20 marks.*

1. Write any two applications of OR.

2. Define the features of the Operations Research.

3. What do you mean by an objective function of an LPP ?

4. What is slack variable ?

5. Define Mathematical formulation of Transportation Problem.

6. What do you mean by degeneracy in a TP ?

7. What is an Assignment model ?

8. Differentiate unbalanced and balanced assignment problem.

9. What is critical path ?

10. Define slack time and total float in the context of network model.

11. What do you mean by sequencing problem ?

12. What are the different types of sequencing problems ?

### Section B (Short Essay Type Questions)

*Answer* **all** *questions.*
*Each question carries 5 marks.*
*Ceiling 30 marks.*

13. What are the limitations of OR ? Explain.

**Turn over**

14. Solve Grapically :

Maximize = $3X_1 + 5X_2$

subject to $X_1 + 2X_2 \leq 2000$

$X_1 + X_2 \leq 1500$

$X_2 \leq 600$

$X_1, X_2 \geq 0.$

15. Suppose a furniture company makes chairs and tables only. Each chair gives a profit of Rs. 20 whereas each table gives Rs. 30. Both products are processed by three machines $M_1$, $M_2$ and $M_3$. Each chair requires 3 hrs, 5 hrs and 2 hrs on $M_1$, $M_2$ and $M_3$ respectively. Whereas the corresponding figures for each table are 3, 2 and 6. The machine $M_1$ can work for 36 hrs per week, whereas $M_2$ and $M_3$ can work for 50 hrs and 60 hrs. Formulate the problem into a LPP in order to maximize the total profit ?

16. Determine initial basic feasible solution for the following Transportation problem using Vogel's method :

|        | 1  | 2  | 3  | 4  | Supply |
|--------|----|----|----|----|--------|
| A      | 21 | 16 | 25 | 13 | 11     |
| B      | 17 | 18 | 14 | 23 | 13     |
| C      | 32 | 27 | 18 | 41 | 19     |
| Demand | 6  | 10 | 12 | 15 |        |

17. Find the optimal solution to the following assignment problem showing the cost for assigning workers to jobs :

$$\begin{array}{ccc} x & y & z \end{array}$$
$$\text{Workers} \begin{bmatrix} 18 & 17 & 16 \\ 15 & 13 & 14 \\ 19 & 20 & 21 \end{bmatrix}$$

18. Distinguish between PERT and CPM.

19. A book binder has one printing press, one binding machine and manuscripts of 7 different books. The time required for performing printing and binding for different books are shown below :

| Book                   | 1  | 2  | 3  | 4  | 5   | 6  | 7  |
|------------------------|----|----|----|----|-----|----|----|
| Printing (time in hrs) | 20 | 90 | 80 | 20 | 120 | 15 | 65 |
| Binding (time in hrs)  | 25 | 60 | 75 | 30 | 90  | 35 | 90 |

Find the elapsed time and idle time for the machines.

## Section C (Essay Type Questions)

*Answer any* **one** *question.*
*The question carries* 10 *marks.*

20. Solve the following linear programming problem :

    Maximize $Z = 9X_1 + 2X_2 + 5X_3$

    Subject to $\quad 2X_1 + 3X_2 - 5X_3 \leq 12$
    $\qquad\qquad 2X_1 - X_2 + 3X_3 \leq 3$
    $\qquad\qquad 3X_1 + X_2 - 2X_3 \leq 2$
    $\qquad\qquad X_1, X_2, X_3 \geq 0.$

21. Solve the minimal assignment problem whose effective matrix is given by the following table :

    |     | 1 | 2 | 3 | 4 |
    |-----|---|---|---|---|
    | I   | 2 | 3 | 4 | 5 |
    | II  | 4 | 5 | 6 | 7 |
    | III | 7 | 8 | 9 | 8 |
    | IV  | 3 | 5 | 8 | 4 |

    $(1 \times 10 = 10$ marks$)$