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Name.....

Reg. No.....

**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 Graphically :

$$\text{Maximize} = 3X_1 + 5X_2$$

$$\text{subject to } X_1 + 2X_2 \leq 2000$$

$$X_1 + X_2 \leq 1500$$

$$X_2 \leq 600$$

$$X_1, X_2 \geq 0.$$

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 :

	x	y	z
Workers	18	17	16
	15	13	14
	19	20	21

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 :

$$\text{Maximize } Z = 9X_1 + 2X_2 + 5X_3$$

$$\text{Subject to } 2X_1 + 3X_2 - 5X_3 \leq 12$$

$$2X_1 - X_2 + 3X_3 \leq 3$$

$$3X_1 + X_2 - 2X_3 \leq 2$$

$$X_1, X_2, X_3 \geq 0.$$

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 × 10 = 10 marks)