**C 22052** **(Pages : 3)** **Name.....**

**Reg. No.....**

**SECOND SEMESTER (CBCSS-UG) DEGREE EXAMINATION, APRIL 2022**

B.C.A.

BCA 2C 04—OPERATIONS RESEARCH

(2021 Admissions)

Time : Two Hours Maximum Marks : 60

**Section A (Short Answer Type Questions)**

*Answer at least* **eight** *questions.*
*Each question carries* 3 *marks.*
*All questions can be attended.*
*Overall Ceiling* 24.

1. What is Operations Research ?
2. What is the role of OR in decision-making ?
3. Write the Mathematical model of a LPP.
4. What do you mean by feasible region in a LPP ? What will be the shape of the feasible region ?
5. What are slack and surplus variables ?
6. What do you mean by dual of a LPP ?
7. Name the three methods for obtaining initial feasible solution of a Transportation problem.
8. What are Unbalanced transportation problems ?
9. Cite any two areas where assignment technique is applied.
10. Write any two applications of Network techniques.
11. Define an Activity and an event.
12. Draw the network diagram to the following activities :

| *Activity* $(i, j)$ | | *Time Duration* |
|---|---|---|
| 1—2 | ... | 2 |
| 1—3 | ... | 4 |
| 1—4 | ... | 3 |
| 2—5 | ... | 1 |
| 3—5 | ... | 6 |
| 4—6 | ... | 5 |
| 5—6 | ... | 7 |

(8 × 3 = 24 marks)

**Turn over**

## Section B (Essay Type Questions)

*Answer at least* **five** *questions.*
*Each question carries* 5 *marks.*
*All questions can be attended.*
*Overall Ceiling* 25.

13. What are the advantages of OR ?

14. Solve graphically the following LPP :

Maximize $Z = 60x_1 + 40x_2$

subject to the constraints $2x_1 + x_2 \leq 60 ; x_1 \leq 25 ; x_2 \leq 35 ; x_1, x_2 \geq 0.$

15. A company sells two types of fertilizers, one is liquid and the other is dry. The liquid fertilizer contains 2 units of chemical A and 4 units of chemical B per jar and the dry fertilizer contains 3 units of the chemicals A and B. The liquid fertilizer sells for Rs. 3 per jar and the dry fertilizer sells for Rs. 4. A farmer requires at least 90 units of chemical A and at least 120 units of chemical B. Formulate the problem into a LPP.

16. Find the initial solution of the following TP by using North-West corner rule :

| | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Supply |
|---|---|---|---|---|---|
| $O_1$ | 190 | 300 | 500 | 100 | 70 |
| $O_2$ | 700 | 300 | 400 | 600 | 90 |
| $O_3$ | 400 | 100 | 600 | 200 | 180 |
| Demand | 50 | 80 | 70 | 140 | |

17. What do you mean by an Assignment problem ? Write the differences between Assignment problems and Transportation problems.

18. Draw a network for a simple project of erection of shed works for a shed. The various elements of project areas shown below :

| *Activity node* | | *Desription* | *Pre-requisites* |
|---|---|---|---|
| A | ... | Erect site workshop | — |
| B | ... | Fence site | — |
| C | ... | Bend reinforcement | A |
| D | ... | Dig foundation | B |
| E | ... | Fabricate steel work | A |
| F | ... | Install concrete plant | B |
| G | ... | Place reinforcement | C, D |
| H | ... | Concrete foundation | G, F |
| I | ... | Paint steel work | E |
| J | ... | Erect steel work | H, I |
| K | ... | Give finishing touch | J |

19. Six jobs go first over machine I and then over machine II. The order of completion of jobs has no significance. The following table gives the machine times in hours for six jobs and the two machines. Find the sequence of jobs that minimises the total elapsed time to complete the jobs. Find the minimum time :

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Job number | : | 1 | 2 | 3 | 4 | 5 | 6 |
| Time on machne I | : | 5 | 9 | 4 | 7 | 8 | 6 |
| Time on machine II | : | 7 | 4 | 8 | 3 | 9 | 5 |

(5 × 5 = 25 marks)

## Section C (Essay Type Question)

*Answer any* **one** *question.*
*The question carries* 11 *marks.*

20. Solve the following LPP by using dual simplex method :

Minimize $Z = 2x_1 + 2x_2$

subject to the constraints :

$$2x_1 + 4x_2 \geq 1 ; x_1 + 2x_2 \geq 1 ; 2x_1 + x_2 \geq 1 ; x_1, x_2 \geq 0.$$

21. Solve the following Transportation problem :

| | $D_1$ | $D_2$ | $D_3$ | $D_4$ | $D_5$ | Supply |
|---|---|---|---|---|---|---|
| $O_1$ | 3 | 4 | 6 | 8 | 9 | 20 |
| $O_2$ | 2 | 10 | 1 | 5 | 8 | 30 |
| $O_3$ | 7 | 11 | 20 | 40 | 3 | 15 |
| $O_4$ | 2 | 1 | 9 | 14 | 16 | 13 |
| Demand | 40 | 6 | 8 | 18 | 6 | |

(1 × 11 = 11 marks)