

**SECOND SEMESTER (CUCBCSS—UG) DEGREE RE-EXAMINATION  
APRIL 2020**

B.C.A.

BCA 2C 04—OPERATIONS RESEARCH

(2017—2018 Admissions)

Time : Three Hours

Maximum : 80 Marks

**Section A**

*Answer all questions.*

*Each question carries 1 mark.*

1. What is operation research ?
2. Write the models of LPP.
3. Define artificial variables.
4. What is degenerate and Non degenerate Basic feasible solution in LPP ?
5. State the limitations of OR.
6. State the transportation problem.
7. Define Travelling Salesman Problem.
8. What do you understand by graphical method ?
9. What is an unbounded solution ?
10. Define Critical Path method.

(10 × 1 = 10 marks)

**Section B**

*Answer all questions.*

*Each question carries 2 marks.*

11. Explain the standard form of a LPP.
12. Explain Duality.
13. Explain Transportation Table.

**Turn over**

14. Difference between CPM and PERT.
15. Define the terms Slack and surplus variables with examples each.
16. Explain the process of  $n$  jobs through 2 machines.
17. What is LPP ?
18. Explain Mathematical formulation of an Assignment Problem.

(8 × 2 = 16 marks)

### Section C

Answer any **six** questions.  
Each question carries 4 marks.

19. Solve the linear programming Problem :

$$\begin{aligned} \text{Maximize } Z &= 3x_1 + 2x_2 \\ \text{subject to } & -2x_1 + x_2 \leq 1, \\ & x_1 \leq 2, \\ & x_1 + x_2 \leq 3 \\ & x_1 \geq 0, x_2 \geq 0 \text{ graphically.} \end{aligned}$$

20. Explain the standard form of a LPP.
21. Find an initial basic feasible solution using least cost method.

	D	E	F	G	Availability
5	2	4	2	22	
From	4	8	1	6	15
	4	6	7	5	8
Demand	7	12	17	9	

22. Solve the Assignment Problem :

Salesman	I	II	III	IV
A	10	12	19	11
B	5	10	7	8
C	12	14	13	11
D	8	15	11	9

23. Explain Slack and float.
24. A company produces two types of hats. Each hat of the first type requires twice as much labour time as the second type. If all hats are of the second type only, the company can produce a total of 500 hats a day. The market limits daily sales of the first and second types to 150 and 250 hats. Assuming the profit per hat is Rs. 8 for type 1 and Rs. 5 for type 2, formulate the problem as a linear programming model in order to determine the number of hats to be produced of each type so as to maximise the profit.
25. Solve the LPP using Dual simplex method :

$$\text{Minimize } Z = 3x_1 + x_2$$

$$\text{subject to } x_1 + x_2 \geq 1, 2x_1 + 3x_2 \geq 2, x_1, x_2 \geq 0.$$

26. Explain VAM method.
27. Explain the difference between Transportation problem and Assignment problem.

(6 × 4 = 24 marks)

#### Section D

*Answer any three questions:  
Each question carries 10 marks.*

28. Use Simplex method to solve the LPP :

$$\text{Maximize } Z = 7x_1 + 5x_2$$

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

$$4x_1 + 3x_2 \leq 12,$$

$$x_1 \geq 0, x_2 \geq 0.$$

29. Solve Transportation Problem :

	D	E	F	G	Available Unit
A	6	1	9	3	70
B	11	5	2	8	55
C	10	12	4	7	90
Requirement	85	35	50	4	

**Turn over**

30. Solve the travelling salesman problem for the following table :

From	To				
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>
F <sub>1</sub>	∞	4	7	3	4
F <sub>2</sub>	4	∞	6	3	4
F <sub>3</sub>	7	6	∞	7	5
F <sub>4</sub>	3	3	7	∞	7
F <sub>5</sub>	4	4	5	7	∞

31. A Project schedule has the following characteristics :—

Activity	Time	Activity	Time
1-2	4	5-6	4
1-3	1	5-7	8
2-4	1	6-8	1
3-4	1	7-8	2
3-5	6	8-10	5
4-9	5	9-10	7

- Construct network diagram ;
- Find EST,LST,EFT, and LFT ; and
- Find critical path and project duration.

32. Ten jobs are required to be processed on two machines in the order, A B. Determine an optimal

Job	1	2	3	4	5	6	7	8	9	10
A	7	8	10	3	7	4	5	8	5	6
B	4	2	6	6	5	7	2	6	7	6

(3 × 10 = 30 marks)