



Register Number:
Date: 25-11-2020

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE-27
BCA – V SEMESTER
SEMESTER EXAMINATION: NOVEMBER 2020
CA5418-OPERATION RESEARCH

Time- 2 1/2 hrs

Max Marks-70

This paper contains three sections

SECTION A

Answer **ALL** questions. Each question carries **TWO** marks $2 \times 10 = 20$

1. Define Operation Research.
2. List the phases in solving an Operation Research problem.
3. Write the following Linear programming problem in standard form.

$$\text{Maximize } Z = 2x_1 + x_2 - 3x_3 + 5x_4$$

Subject to

$$x_1 + 7x_2 + 3x_3 + 7x_4 \leq 46$$

$$3x_1 - x_2 + x_3 + 2x_4 \leq 8$$

$$2x_1 + 3x_2 - x_3 + x_4 \leq 10$$

4. Why do we apply heavy penalty to artificial variable in the objective function for solving linear programming problem?

5. Define Slack and Surplus variables.
6. Explain the rule to determine the saddle point.

7. Find the row minima values for the following matrix

	A	B	C	D
1	10	12	19	11
2	5	10	7	8
3	12	14	13	11
4	8	15	18	9

8. What is a Dummy Activity? Explain with an example.

9. What are the time estimates for an activity in PERT network?

10. What is a strategy? What are the different strategies?

SECTION B

Answer any FIVE questions.

6*5=30

11. Solve the following LPP using Simplex Method

$$\text{Minimize } Z = 2x_1 - 3x_2 + 6x_3$$

Subject to constraints:

$$3x_1 - x_2 + 2x_3 \leq 7$$

$$2x_1 + 4x_2 \geq -12$$

$$-4x_1 + 3x_2 + 8x_3 \leq 10$$

where $x_1, x_2, x_3 \geq 0$

12. Formulate the following problem as linear programming problem:

A firm is engaged in producing two models A and B performs three operations painting, assembling and testing. The relevant data is given below:

MODEL	UNIT SALE PRICE	HOURS REQUIRED FOR EACH UNIT		
		ASSEMBLING	PAINTING	TESTING
A	Rs 50	1.0	0.2	0.0
B	Rs 80	1.5	0.2	0.1

13. Solve the following transportation problem using least cost method.

	D1	D2	D3	D4	Availability
S1	10	2	20	11	15
S2	12	7	9	20	25
S3	4	14	16	18	10
Requirement	5	15	15	15	

14. Solve the following assignment problem using Hungarian method. The matrix entries represent the processing time in hours.

	A	B	C	D
1	5	3	2	8
2	7	9	2	6
3	6	4	5	7
4	5	7	7	8

15. Find the initial basic feasible solution for the following transportation problem using VAM method

	D1	D2	D3	D4	Supply
S1	2	3	11	7	6
S2	1	0	6	1	1
S3	5	8	15	9	10
Demand	7	5	3	2	

16. For the following pay-off matrix for Firm A, determine the optimal strategy for both the firms and find the value of the game and the probabilities of each firm.

		FIRM B				
		P	Q	R	S	T
FIRM A	D	3	-1	4	6	7
	C	-1	8	2	4	12
	B	16	8	6	14	12
	A	1	11	-4	2	1

17. a. Explain any three components of Network.

b. Construct an activity-on arrow diagram for the following dependency table for a particular project.

JOBS	PREDECESSOR
A	-
B	A
C	A
D	C
E	B,C
F	D,E

SECTION C

Answer any TWO questions.

10*2=20

18. Solve the following TSP so as to minimize the cost per cycle.

	A	B	C	D	E
A	-	2	5	7	1
B	6	-	3	8	2
C	8	7	-	4	7
D	12	4	6	-	5
E	1	3	2	8	-

19. Solve the following game graphically where the payoff matrix for Player A is as given below:

	1	2
s1	6	-7
s2	1	3
s3	3	1
s4	5	-1

20. Consider the following table summarizing the details of a project.

ACTIVITY	PREDECESSOR	DURATION		
		O	M	P
A	-	5	6	7
B	-	1	3	5
C	-	1	4	7
D	A	1	2	3
E	B	1	2	9
F	C	1	5	9
G	C	2	2	8
H	E,F	4	4	10
I	D	2	5	8
J	H,G	2	2	8

- Construct the project network diagram.
- Find the expected duration and variance of each activity