

(8 pages)

Reg. No. :

Code No. : 10762 E Sub. Code : EECA 21

B.C.A. (CBCS) DEGREE EXAMINATION,
APRIL 2024.

Second Semester

Computer Application

Elective – OPTIMIZATION TECHNIQUES

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. What are the methods used for solving OR models?
 - (a) Trial and error only
 - (b) Analytical methods and computer algorithms
 - (c) Qualitative analysis only
 - (d) Statistical analysis only
2. Mention some advantages of using Operations Research Techniques.
 - (a) Increased efficiency, better decision-making and cost savings
 - (b) Decreased productivity, increased complexity and higher costs
 - (c) Increased uncertainty, reduced flexibility and slower decision making
 - (d) Decreased accuracy, decreased profitability and higher risk

3. What is the standard form of linear programming problem?
 - (a) Maximization problem with inequality constraints
 - (b) Minimization problem with equality constraints
 - (c) Minimization problem with non-negativity constraints
 - (d) Maximization problem with non-negativity constraints
4. What do slack variables represent in an LP problem?
 - (a) Unused resources
 - (b) Excess resources
 - (c) Shortages of resources
 - (d) Objective function is maximized
5. Which step of the Hungarian method involves subtracting the smallest entry in each row from all entries in that row?
 - (a) Initialization
 - (b) Row reduction
 - (c) Column reduction
 - (d) Line covering
6. What is the objective of an assignment problem?
 - (a) Minimize the total cost or maximize the total benefit
 - (b) Maximize the total cost or minimize the total benefit
 - (c) Balance the number of tasks and agents
 - (d) Allocate resources randomly

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7. Which method iteratively allocates to the cell with the highest penalty?

- (a) Northwest Corner Method
- (b) Least Cost Method
- (c) Vogel's Approximation Method
- (d) Stepping Stone Method

8. What is the objective of a transportation problem?

- (a) Minimize the total transportation
- (b) Max the total transportation
- (c) Maximize the total supply
- (d) Minimize the total demand

9. What is the first step in utilizing PERT and CPM techniques for project management?

- (a) Constructing a network diagram
- (b) Identifying activities
- (c) Estimating activity durations
- (d) Sequence activities.

10. Fulkerson's algorithm is used primarily for

- (a) Resource allocation
- (b) Job sequencing
- (c) Critical path analysis
- (d) Network flow problems

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PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) What is model? Discuss various classification schemes of models.

Or

(b) Identify and describe the key applications of OR across various industries.

12. (a) Explain graphical method of solving LPP.

Or

(b) Describe simple method for solving LPP.

13. (a) Outline the Hungarian method to solve AP.

Or

(b) Write down the mathematical formulation of an AP.

14. (a) Determine an IBFS to the following TP by using NWCR.

	D1	D2	D3	D4	Supply
S1	21	16	15	3	11
S2	19	18	14	23	13
S3	32	27	18	41	19
Demand	6	6	8	23	

Or

(b) Describe the TP with its General Mathematical Formulation.

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[P.T.O.]



15. (a) Illustrate the concept of a Network diagram in PERT and CRM.

Or

- (b) A project has the following characteristic. Draw a network diagram and find the critical path.

Activity	A	B	C	D	E	F	G	H
Predecessors	—	A	A	B	B	D,E	C	C,F,G
Duration	2	4	8	3	2	3	4	8

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) State the different types of models used in OR. Explain briefly the general methods for solving these OR models.

Or

- (b) Outline the scope, advantages and disadvantages of using OR in decision-making processes.

17. (a) Solve the following LPP by using graphical method.

$$\text{Max } Z = 40x_1 + 80x_2$$

Subject to

$$x_1 + 3x_2 \leq 48$$

$$x_1 \leq 15$$

$$x_2 \leq 10$$

$$x_1, x_2 \geq 0$$

Or

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- (b) Solve the following problem using Simplex Method.

$$\text{Max } Z = 21x_1 + 15x_2$$

Subject to

$$-x_1 - 2x_2 \geq -6$$

$$4x_1 + 3x_2 \geq 12$$

18. (a) Solve the AP.

	J ₁	J ₂	J ₃	J ₄
C1	15	27	35	26
C2	21	29	33	17
C3	17	25	37	15
C4	14	31	39	21

Or

- (b) Solve the AP.

		TO				
		A	B	C	D	E
From	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. (a) Solve the TP by using VAM Method

	D ₁	D ₂	D ₃	D ₄	Supply
11	13	17	14		250
16	18	14	10		300
21	24	13	10		400
Demand	200	225	275	250	

Or

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(b) Solve the TP by using MODI Method.

TO			Supply
16	19	12	14
22	13	19	16
14	28	8	12

Demand 10 15 17

20. (a) The following table gives the data for the activities of a small project.

Job	Optimistic	Most likely	Pessimistic
1-2	1	4	7
1-3	5	10	17
2-4	3	3	3
2-6	1	4	7
3-4	8	15	26
3-5	2	4	8
4-5	5	5	5
5-6	2	5	8

- Draw the network and find the expected project completion time.
- What is the probability that would take 5 days more than the expected duration.
- Find the project completion time which will have 95% confidence.

Or

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(b) The following table gives the activities in a construction project and other relevant information.

Activity	1-2	1-3	2-3	2-4	3-4	4-5
Duration	20	25	10	12	6	10

- Draw the network for the project.
- Find the critical path and the project duration
- Find the TF, FT and IF for each activity.

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