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Roll No. _____

Question Booklet Number

3728839

O.M.R. Serial No. :

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BCA IV Semester (NEP) Examination, 2025-26

OPTIMIZATION TECHNIQUES

Paper Code

B	C	A	4	0	0	4
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Question Booklet
Series

C

Time : 1 : 30 Hours]

[Maximum Marks : 75

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.
2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. **All** questions carry equal marks.
3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.
4. Four alternative answers are mentioned for each question as – A, B, C & D in the booklet. The candidate has to choose the correct answer and mark the same in the OMR Answer-Sheet as per the direction :

(Remaining instructions on the last page)

परीक्षार्थियों के लिए निर्देश :

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।
2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। सभी प्रश्नों के अंक समान हैं।
3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गये हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।
4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर- A, B, C तथा D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छँटना है। उत्तर को OMR उत्तर-पत्रक में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

(शेष निर्देश अन्तिम पृष्ठ पर)

1. If the objective function is parallel to a constraint boundary, then:
 - (A) Unique solution exists
 - (B) No solution exists
 - (C) Multiple optimal solutions may exist
 - (D) Problem becomes infeasible
2. To balance an unbalanced transportation problem, we add:
 - (A) Extra constraint
 - (B) Artificial variable
 - (C) New objective function
 - (D) Dummy row or column
3. North-West Corner Rule is used to:
 - (A) Find optimal solution
 - (B) Find initial feasible solution
 - (C) Check degeneracy
 - (D) Balance problem
4. The Column Minima Method is primarily used in:
 - (A) Linear programming problems
 - (B) Assignment problems
 - (C) Transportation problems
 - (D) Integer programming problems
5. Dominance rule is used to:
 - (A) Find optimal strategy directly
 - (B) Calculate probabilities
 - (C) Solve linear programming problems
 - (D) Reduce the size of payoff matrix
6. If a column is dominated, it is eliminated because:
 - (A) It gives maximum payoff to player A
 - (B) It gives minimum payoff to player A
 - (C) Player B will never choose it
 - (D) It is not feasible
7. The standard form of an LPP requires:
 - (A) All constraints to be inequalities
 - (B) All constraints to be equalities
 - (C) Only $\leq$ constraints
 - (D) Only $\geq$ constraints
8. Artificial variables are added in case of:
 - (A) Only $\leq$ constraints
 - (B) Only $=$ constraints
 - (C) $\geq$ and $=$ constraints
 - (D) None
9. Which method requires LPP in standard form?
 - (A) Graphical method
 - (B) Simplex method
 - (C) Hungarian method
 - (D) Game theory

10. Which rule is used for optimal sequence in 2-machine problem?
- Johnson's rule
 - Hungarian method
 - Simplex method
 - MODI method
11. In the standard form of an LPP, if a constraint is of the form $x + y \geq 10$, it can be converted into an equality by:
- Adding a slack variable
 - Subtracting a surplus variable
 - Adding an artificial variable
 - Subtracting a slack variable
12. In maximization problem, we convert it to minimization by:
- Subtracting from largest element
 - Adding values
 - Multiplying by zero
 - Ignoring values
13. Consider 3 jobs with processing times (in hours):
- Job A: $M_1=2, M_2=5$
- Job B: $M_1=4, M_2=3$
- Job C: $M_1=6, M_2=1$
- Optimal sequence:
- $A \rightarrow B \rightarrow C$
 - $C \rightarrow B \rightarrow A$
 - $A \rightarrow C \rightarrow B$
 - $B \rightarrow A \rightarrow C$
14. Dominance rule is mainly applied in:
- Cooperative games
 - Dynamic game
 - Non-mathematical games
 - Zero-sum games
15. If one strategy is strictly better than another in all situations, it is called:
- Mixed strategy
 - Pure strategy
 - Dominating strategy
 - Saddle point
16. Hungarian method requires the matrix to be:
- Rectangular
 - Square
 - Triangular
 - Diagonal
17. Column reduction means:
- Subtract smallest element from each column
 - Subtract largest element
 - Add values
 - Multiply values

18. First step in Hungarian method is:
- (A) Row reduction
 - (B) Column reduction
 - (C) Assignment
 - (D) Optimality check
19. Find idle time of Machine 2 for sequence A $\rightarrow$ B:
- Job A: M1=3, M2=5
Job B: M1=2, M2=4
- (A) 1
 - (B) 2
 - (C) 3
 - (D) 4
20. Maximum idle time occurs when:
- (A) Improper sequencing
 - (B) Perfect scheduling
 - (C) Minimum jobs
 - (D) Equal times
21. After applying the dominance rule, the resulting matrix still has no saddle point. What should be done next?
- (A) Apply duality
 - (B) Use graphical method
 - (C) Use the mixed strategy method
 - (D) Stop solving
22. Value of a game represents:
- (A) Total strategies
 - (B) Expected payoff to a player
 - (C) Number of players
 - (D) Number of move
23. Value of game represents:
- (A) Profit of A
 - (B) Loss of B
 - (C) Both A and B (opposite sign)
 - (D) None
24. If all elements in a row are less than corresponding elements in another row, then:
- (A) First row dominates
 - (B) Second row dominates
 - (C) No dominance
 - (D) Both dominate
25. In the simplex method, the variables which are not in the solution are called:
- (A) Non-basic variables
 - (B) basic variables
 - (C) Slack variables
 - (D) Artificial variables

26. If $\text{maximin} < \text{minimax}$, then:
- (A) Saddle point exists
 - (B) Game solved
 - (C) Pure strategy used
 - (D) No saddle point
27. In mixed strategy, probabilities must:
- (A) Be equal
 - (B) Sum to 1
 - (C) Be zero
 - (D) Be infinite
28. PERT uses which type of time estimates?
- (A) One time estimate
 - (B) Two time estimates
 - (C) Three time estimates
 - (D) Four time estimates
29. Which step comes after subtracting row and column minimums in the Hungarian method?
- (A) Make dummy row
 - (B) Multiply the matrix
 - (C) Add rows and columns
 - (D) Draw minimum number of lines to cover all zeros
30. If optimistic = 3, most likely = 6, pessimistic = 9, TE =
- (A) 5
 - (B) 6
 - (C) 7
 - (D) 8
31. Standard deviation in PERT is:
- (A) $(b - a)/3$
 - (B) $(b - a)/6$
 - (C) $(a + b)/2$
 - (D) $\sqrt{\text{variance}}$
32. If all constraints are $\leq$ type, number of artificial variables is:
- (A) 0
 - (B) 1
 - (C) 2
 - (D) Equal to constraint
33. Standard form of LPP requires:
- (A) Only inequalities
 - (B) Only equalities
 - (C) All constraints as equations
 - (D) Random form

34. ϵ (epsilon) in degeneracy represents:
- (A) Infinite cost
 - (B) Very small positive number
 - (C) Zero demand
 - (D) Large cost
35. Which one of the following is common in both PERT and CPM?
- (A) Time estimates
 - (B) Cost analysis
 - (C) Network diagram
 - (D) Probabilistic approach
36. The formula for expected time (TE) in PERT is:
- (A) $(O + P + 4M)/6$
 - (B) $(O + M + P)/3$
 - (C) $(O + 4M + P)/6$
 - (D) $(O + 2M + P)/4$
37. Slack or float is associated with:
- (A) Only critical activities
 - (B) Non-critical activities
 - (C) All activities
 - (D) None of the above
38. Probability in PERT is based on:
- (A) Normal distribution
 - (B) Poisson distribution
 - (C) Binomial only
 - (D) Uniform only
39. If minimum number of lines = order of matrix, solution is:
- (A) Not feasible
 - (B) Optimal
 - (C) Degenerate
 - (D) Unbounded
40. In a minimization transportation problem, a negative opportunity cost in MODI method indicates:
- (A) A basic variable
 - (B) An optimal solution
 - (C) A possibility of reducing total cost
 - (D) An infeasible allocation
41. Matrix becomes 2×2 after removing dominated row. Next step is:
- (A) Solve 2×2 game
 - (B) Stop
 - (C) Apply VAM
 - (D) Use simplex
42. If no row or column dominates another, we:
- (A) Stop
 - (B) Use mixed strategy
 - (C) Add dummy
 - (D) Use VAM

43. Dominance rule applies to:
- (A) Only rows
 - (B) Only columns
 - (C) Both rows and columns
 - (D) Only diagonal
44. MODI method is used for:
- (A) Obtaining an initial solution
 - (B) Checking feasibility
 - (C) Balancing the problem
 - (D) Testing and improving optimality
45. Which method is considered better for finding the initial solution in terms of cost?
- (A) North-West Corner Rule
 - (B) Matrix Minima Method
 - (C) Vogel's Approximation Method (VAM)
 - (D) MODI Method
46. If a constraint is written as $x + y \geq 10$, it means:
- (A) At most 10
 - (B) At least 10
 - (C) Exactly 10
 - (D) Less than 10
47. Each unit of X requires 2 hours, Y requires 3 hours. Total available = 12 hours Constraint is:
- (A) $2x + 3y \geq 12$
 - (B) $x + y = 12$
 - (C) $2x + 3y \leq 12$
 - (D) $3x + 2y \leq 12$
48. If supply = 80 and demand = 100, we should:
- (A) Subtract demand
 - (B) Add dummy supply of 20
 - (C) Add dummy demand of 20
 - (D) Ignore
49. Value of game for fair game is:
- (A) Positive
 - (B) Negative
 - (C) Zero
 - (D) Infinite
50. Game with no saddle point is solved using:
- (A) Pure strategy
 - (B) Mixed strategy
 - (C) Graphical method
 - (D) Both (B) and (C)

51. If payoff matrix has saddle point, then:
- (A) Mixed strategy used
 - (B) Pure strategy used
 - (C) No strategy
 - (D) Infinite solution
52. Minimax value is:
- (A) Minimum of column maxima
 - (B) Maximum of row minima
 - (C) Maximum of column minima
 - (D) Minimum of row minima
53. Maximin value is:
- (A) Maximum of row minima
 - (B) Minimum of row maxima
 - (C) Maximum of column maxima
 - (D) Minimum of column minima
54. Strategy means:
- (A) Random decision
 - (B) Complete plan of action
 - (C) One move
 - (D) Constraint
55. If supply equals demand for a cell, we:
- (A) Delete both row and column
 - (B) Delete only row
 - (C) Delete only column
 - (D) Keep both
56. Penalty in VAM is defined as:
- (A) Sum of costs
 - (B) Difference between two smallest costs
 - (C) Maximum cost
 - (D) Minimum cost
57. Primal:
- $$\text{Max } Z = 3x_1 + 2x_2$$
- Subject to:
- $$x_1 + x_2 \leq 4$$
- Dual objective function is:
- (A) $\text{Max } W = 4y$
 - (B) $\text{Min } W = 3y$
 - (C) $\text{Max } W = 3y$
 - (D) $\text{Min } W = 4y$
58. If primal is unbounded, dual is:
- (A) Feasible
 - (B) Infeasible
 - (C) Optimal
 - (D) Finite

59. Number of constraints in dual equals:
- (A) Number of variables in primal
 - (B) Number of constraints in primal
 - (C) Sum of both
 - (D) None
60. A basic feasible solution in transportation problem must satisfy:
- (A) $m + n - 1$ allocations
 - (B) $m \times n$ allocations
 - (C) Only cost condition
 - (D) Infinite allocations
61. If allocations $< m + n - 1$, the solution is:
- (A) Balanced
 - (B) Optimal
 - (C) Degenerate
 - (D) Unbounded
62. If highest penalty row has tie, then choose:
- (A) Random
 - (B) Highest cost
 - (C) Lowest cost cell in that row
 - (D) Ignore row
63. Closed loop is used in:
- (A) Initial solution
 - (B) Optimality test
 - (C) Assignment
 - (D) Graph
64. In MODI, $u_i + v_j = c_{ij}$ is used for:
- (A) Basic cells
 - (B) Non - basic cells
 - (C) Dummy cells
 - (D) All cells
65. Initial feasible solution can be obtained by:
- (A) North-West Corner Rule
 - (B) Least Cost Method
 - (C) Vogel's Approximation Method
 - (D) All of these
66. Group replacement is suitable when:
- (A) One item fails
 - (B) Many items fail randomly
 - (C) Only machines
 - (D) No failure
67. Subject to:
- $$x + y \leq 4, x, y \geq 0$$
- Optimal value is:
- (A) 8
 - (B) 10
 - (C) 12
 - (D) 6

68. If feasible region is unbounded and Z keeps increasing, then:
- (A) Unique solution
 - (B) Finite solution
 - (C) Unbounded solution
 - (D) Infeasible
69. Feasible region is:
- (A) Area satisfying all constraints
 - (B) Only objective function
 - (C) Outside region
 - (D) Random region
70. If all constraints are $\leq$ type, feasible region lies:
- (A) Towards origin
 - (B) Away from origin
 - (C) Random
 - (D) Infinite
71. The first step in formulating an LPP is:
- (A) Solving the model
 - (B) Defining the decision variables
 - (C) Writing constraints
 - (D) Graphical solution
72. The payoff value for which each player in a game always selects the same strategy is called the
- (A) saddle point.
 - (B) equilibrium point
 - (C) Both (A) and (B)
 - (D) None of these
73. If $EF = 10$ and $LF = 10$, activity is:
- (A) Non-critical
 - (B) Critical
 - (C) Dummy
 - (D) Optional
74. Free float is:
- (A) Delay without affecting successors
 - (B) Total delay
 - (C) Project delay
 - (D) Zero time
75. The origin of Operations Research is traced back to:
- (A) Space research programs
 - (B) Civil engineering projects
 - (C) World War II military operations
 - (D) Industrial Revolution

76. If $ES = 3$ and $LS = 3$, float is:
 (A) 0
 (B) 3
 (C) 6
 (D) 1
77. Group replacement policy is generally more economical when:
 (A) Failure rate is low
 (B) Individual replacement is cheap
 (C) There is a high cost of individual failure
 (D) Items have a long life
78. CPM is mainly used for:
 (A) Probabilistic projects
 (B) Uncertain activities
 (C) Random projects
 (D) Deterministic projects
79. If slack of an activity becomes negative, it means:
 (A) Project is early
 (B) Project is delayed
 (C) No change
 (D) Activity removed
80. Total float is:
 (A) Extra time without delaying project
 (B) Total project time
 (C) Minimum time
 (D) Idle time only
81. Maximize $Z = 3x + 2y$ Subject to:
 $x + y \leq 4, x, y \geq 0$
 Optimal value of Z is:
 (A) 10
 (B) 6
 (C) 8
 (D) 12
82. If optimistic = pessimistic = most likely, then:
 (A) Variance = 1
 (B) Variance = 0
 (C) Variance = ∞
 (D) Cannot be determined
83. Replacement is required when:
 (A) Profit increases
 (B) Cost decreases
 (C) Maintenance cost increases with time
 (D) Demand decreases
84. In a zero-sum game, if player A's gain is 5, then player B's loss is:
 (A) 0
 (B) 10
 (C) -5
 (D) 5

85. In dominance principle, if all elements of a row are greater than or equal to the corresponding elements of another row, then:
- (A) Dominated row can be removed
 - (B) Dominating row can be removed
 - (C) Both rows must be retained
 - (D) No action is taken
86. In a payoff matrix, rows represent:
- (A) Strategies of player A
 - (B) Strategies of player B
 - (C) Payoffs only
 - (D) Constraints
87. Primal:
- Max $Z = 5x_1 + 4x_2$
- Subject to:
- $2x_1 + x_2 \leq 6$
- Dual constraint is:
- (A) $y \leq 5, y \leq 4$
 - (B) $y \geq 5, y \geq 4$
 - (C) $2y \geq 5, y \geq 4$
 - (D) $2y \leq 5, y \leq 4$
88. If there are two critical paths, then:
- (A) Project duration changes
 - (B) Project becomes shorter
 - (C) Both paths have equal duration
 - (D) One path is ignore
89. If an activity is not on the critical path, then its slack is:
- (A) Zero
 - (B) Positive
 - (C) Negative
 - (D) Infinite
90. If critical path length = 20, project duration is:
- (A) 10
 - (B) 15
 - (C) 20
 - (D) 25
91. Big-M method is used to:
- (A) Remove slack variables
 - (B) Reduce Matrix
 - (C) Solve dual problem
 - (D) Handle artificial variables
92. Alternate optimal solution in Simple Method exists when:
- (A) All values positive
 - (B) A non-basic variable has zero coefficient in objective row
 - (C) All variables basic
 - (D) No constraints

93. If a game has no saddle point, the solution is obtained using:
- (A) Pure strategy
 - (B) Dominance rule only
 - (C) Mixed strategy
 - (D) Linear regression
94. Initial solution in simplex method is:
- (A) Optimal solution
 - (B) Infeasible solution
 - (C) Basic feasible solution
 - (D) Arbitrary solution
95. Simplex method is an:
- (A) Graphical method
 - (B) Algebraic iterative method
 - (C) Numerical integration method
 - (D) Heuristic method
96. A zero-sum game is one in which:
- (A) All players lose
 - (B) Playoffs are always zero
 - (C) Everyone wins
 - (D) Total gains equal total losses
97. A feasible region in an LPP is always:
- (A) Circular
 - (B) Convex
 - (C) Triangular
 - (D) Irregular
98. If feasible region is unbounded, then:
- (A) No solution exists
 - (B) Infinite solutions always
 - (C) Optimal solution may or may not exist
 - (D) Only one solution exists
99. The feasible region is:
- (A) Area satisfying all constraints
 - (B) Area outside constraints
 - (C) Only boundary lines
 - (D) Random region
100. In game theory, a "player" refers to:
- (A) Only a human participant
 - (B) Any decision-making entity
 - (C) Only firms in a market
 - (D) Only individuals