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(To be filled in the
OMR Sheet)

प्रश्नपुस्तिका क्रमांक
Question Booklet No.

O.M.R. Serial No.

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प्रश्नपुस्तिका सीरीज
Question Booklet Series

B

BCA (Fourth Semester) Examination, July-2022

BCA-404(N)

Optimization Techniques

Time : 1:30 Hours

Maximum Marks-100

जब तक कहा न जाय, इस प्रश्नपुस्तिका को न खोलें

- K-375**
- निर्देश : —
- परीक्षार्थी अपने अनुक्रमांक, विषय एवं प्रश्नपुस्तिका की सीरीज का विवरण यथास्थान सही- सही भरें, अन्यथा मूल्यांकन में किसी भी प्रकार की विसंगति की दशा में उसकी जिम्मेदारी स्वयं परीक्षार्थी की होगी।
 - इस प्रश्नपुस्तिका में 100 प्रश्न हैं, जिनमें से केवल 75 प्रश्नों के उत्तर परीक्षार्थियों द्वारा दिये जाने हैं। प्रत्येक प्रश्न के चार वैकल्पिक उत्तर प्रश्न के नीचे दिये गये हैं। इन चारों में से केवल एक ही उत्तर सही है। जिस उत्तर को आप सही या सबसे उचित समझते हैं, अपने उत्तर पत्रक (O.M.R. ANSWER SHEET) में उसके अक्षर वाले वृत्त को काले या नीले बाल प्वाइंट पेन से पूरा भर दें। यदि किसी परीक्षार्थी द्वारा किसी प्रश्न का एक से अधिक उत्तर दिया जाता है, तो उसे गलत उत्तर माना जायेगा।
 - प्रत्येक प्रश्न के अंक समान हैं। आप के जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
 - सभी उत्तर केवल ओ०एम०आर० उत्तर पत्रक (O.M.R. ANSWER SHEET) पर ही दिये जाने हैं। उत्तर पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
 - ओ०एम०आर० उत्तर पत्रक (O.M.R. ANSWER SHEET) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाय।
 - परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी ओ०एम०आर० शीट उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें।
 - निगेटिव मार्किंग नहीं है।
- महत्वपूर्ण : — प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्नपुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्ष निरीक्षक को दिखाकर उसी सीरीज की दूसरी प्रश्नपुस्तिका प्राप्त कर लें।

Rough Work / रफ कार्य

1. The maximum value of $Z = 3x + 4y$ subjected to constraints $x + y \leq 4$, $x \geq 0$ and $y \geq 0$ is:
 - (A) 12
 - (B) 14
 - (C) 16
 - (D) None of the above
2. Which of the following is a type of Linear programming problem?
 - (A) Manufacturing problem
 - (B) Diet problem
 - (C) transportation problems
 - (D) All of the above
3. In simplex method slack variables are assigned zero coefficients because:
 - (A) No contribution in objective function
 - (B) High contribution in objective function
 - (C) Divisor contribution in objective function
 - (D) Base contribution in objective function
4. The method used to solve LPP with use of artificial variables is called:
 - (A) Dual simplex
 - (B) Graphical
 - (C) Big-M
 - (D) Transportation Problem
5. The C_j row in a simplex table for maximization represents:
 - (A) Profit per unit
 - (B) Constraints
 - (C) Gross profit
 - (D) Net profit

6. The Intersection value of key column and key row is called:
- (A) Vital element
 - (B) Important element
 - (C) key element
 - (D) Basic element
7. In simplex, a maximization problem is optimal when $C_j - Z_j$ values are?
- (A) Either zero or positive
 - (B) Either zero or negative
 - (C) Only positive
 - (D) Only negative
8. The simplex method is the basic method for:
- (A) Value analysis
 - (B) Operation research
 - (C) Linear programming
 - (D) Model analysis
9. Which of the following is true in case of simplex method?
- (A) The constants of constraints may be positive or negative
 - (B) Inequalities are not converted into equations
 - (C) It cannot be used for two variable problems
 - (D) It is an iterative procedure
10. Linear Programming Problem is a technique of finding the:
- (A) Optimal value
 - (B) approximate value
 - (C) Initial value
 - (D) Infeasible value

11. The assignment problem will have alternate solutions when the total opportunity cost matrix has:
- (A) At least one zero in each row and column
 - (B) When all rows have two zero
 - (C) When there is a tie between zero opportunity cost cells
 - (D) If two diagonal elements are zeros
12. The average arrival rate in a single server queuing system is 10 customers per hour and average service rate is 15 customers per hour. The average time that a customer must wait before it is taken up for service shall be _____ minutes.
- (A) 6
 - (B) 8
 - (C) 10
 - (D) 12
13. The coefficient of an artificial variable in the objective function of penalty method are always assumed to be _____.
- (A) 0
 - (B) 1
 - (C) M
 - (D) -M
14. The process that performs the services to the customer is known as _____.
- (A) Queue
 - (B) Service channel
 - (C) Customers
 - (D) Server

15. In the optimal simplex table, $Z_j - C_j = 0$ value indicates _____.
(A) Alternative solution
(B) Bounded solution
(C) Infeasible solution
(D) Unbounded solution
16. When $D = 18000$, holding cost = Rs. 1.20, set-up cost = Rs. 400, EOQ = _____.
(A) 3465
(B) 3750
(C) 3500
(D) 4000
17. Given arrival rate = 15/hr., service rate = 20/hr., the value of traffic intensity is _____.
(A) $3/4$
(B) $4/3$
(C) $3/5$
(D) $4/5$
18. While solving an assignment problem, an activity is assigned to a resource with zero opportunity cost because objective is to _____.
(A) Minimize total cost of assignment
(B) Reduce total cost of assignment to zero
(C) Reduce cost of that assignment to zero
(D) Maximize total cost of assignment
19. Maximization assignment problem is transformed into a minimization problem by _____.
(A) Adding each entry in a column from the maximum value in that column
(B) Subtracting each entry in a column from the maximum value in that column
(C) Subtracting each entry in the table from the maximum value in that table
(D) Adding each entry in the table from the maximum value in that table

20. In marking assignments, which of the following should be preferred?
- (A) Only row having single zero
 - (B) Only column having single zero
 - (C) Only row/column having single zero
 - (D) Column having more than one zero
21. In operations research, the _____ are prepared for situations.
- (A) Mathematical models
 - (B) Physical models diagrammatic
 - (C) Diagrammatic models
 - (D) None of these
22. Operations research was known as an ability to win a war without really going in to _____.
- (A) Battle field
 - (B) Fighting
 - (C) The opponent
 - (D) Both (A) and (B)
23. Or has a characteristic that it is done by a team of:
- (A) Scientists
 - (B) Mathematicians
 - (C) Academics
 - (D) All of the above
24. Which technique is used in finding a solution for optimizing a given objective, such as profit maximization or cost reduction under certain constraints?
- (A) Quailing theory
 - (B) Waiting Line
 - (C) Both (A) and (B)
 - (D) Linear Programming

25. Minimize $Z =$ _____.
(A) -maximize (Z)
(B) -maximize($-Z$)
(C) Maximize($-Z$)
(D) None of the above
26. The purpose of dummy source or dummy destination in a transportation problem is to:
(A) Prevent the solution from becoming degenerate
(B) Obtain a balance between total supply and total demand
(C) Make certain that the total cost does not exceed some specified figure
(D) Provide a means of representing a dummy problem
27. The initial solution of a transportation problem can be obtained by applying any known method. However, the only condition is that:
(A) The solution be optimal
(B) The rim conditions are satisfied
(C) The solution not be degenerate
(D) All of the above
28. Which of the following methods is used to verify the optimality of the current solution of the transportation problem?
(A) Least cost method
(B) Vogel's approximation method
(C) Modified distribution method
(D) All of the above

29. If the order quantity (size of order) is increased, _____.
(A) Holding costs decrease and ordering costs increase
(B) Holding costs increase and ordering costs decrease
(C) The total costs increase and then decrease
(D) Storage cost as well as stock out cost increases
30. A machine is replaced when an average running cost?
(A) Is not equal to the current running cost
(B) Till the current period is greater than that of next period
(C) Of the current period is greater than that of the next period
(D) of the current period is less than that of next period
31. Replacement is said to be necessary if:
(A) Failure rate is increasing
(B) Failure cost is increasing
(C) Failure probability is increasing
(D) Any of these
32. In the formula of Economic Order Quantity, the alphabet 'O' stands for _____.
(A) Ordering level
(B) Ordering cost
(C) Ordering & carrying cost
(D) None
33. The unused material are returned to stores with a material and _____ note.
(A) Acceptance
(B) Transfer
(C) Return
(D) None

34. Cost of goods available for sale can be calculated be:
- (A) Opening stock + purchases
 - (B) Closing stock + purchases
 - (C) Opening stock + purchases – closing stock
 - (D) None
35. The term jockeying in queuing theory refers to:
- (A) Not entering the long queue
 - (B) Leaving the queue
 - (C) Shifting form one queue to another parallel queue
 - (D) None of the above
36. Cars arrive at a service station according to Poison's distribution with mean rate of 5 per hour. The Service time per car is exponential with a mean of 10 minutes. At steady state, the average waiting time in the queue is:
- (A) 10 minutes
 - (B) 25 minutes
 - (C) 25 minutes
 - (D) 50 minutes
37. The system of loading and unloading of goods usually follows:
- (A) LIFO
 - (B) FIFO
 - (C) SIRO
 - (D) SBP
38. When a doctor attends to an emergency case leaving his regular service is called:
- (A) Reneging
 - (B) Balking
 - (C) Pre-emptive queue discipline
 - (D) Non Pre-Emptive queue discipline

39. Which among the following costs is the expense of storing inventory for a specified period of time?
- (A) Purchasing cost
 - (B) Carrying cost
 - (C) Financial cost
 - (D) Storing cost
40. Graphical method is also known as _____.
- (A) Simplex method
 - (B) Dual simplex method
 - (C) Big-M method
 - (D) Search-Approach method
41. The _____ variable is used for the greater than or equal to (\geq) type of constraint.
- (A) Only slack
 - (B) Surplus and Artificial
 - (C) Only Artificial
 - (D) Basic
42. If all C_{ij} values in the entering variable column of the simplex table are negative, then _____.
- (A) There are multiple solutions
 - (B) There exist no solution
 - (C) Solution is degenerate
 - (D) Solution is unbounded
43. The right hand side constant of a constraint in a primal problem appears in the corresponding. Dual as _____.
- (A) Coefficient in the objective function
 - (B) A right hand side constant of a function
 - (C) An input output coefficient
 - (D) A left hand side constraint coefficient variable

44. If primal linear programming problem has a finite solution, then dual linear programming problem should have _____.
(A) Finite solution
(B) Infinite solution
(C) Bounded solution
(D) Alternative solution
45. Cells in the transportation problem having positive allocation will be called:
(A) Cells
(B) Occupied
(C) Unoccupied
(D) Table
46. The transportation problem deals with the transportation of _____.
(A) A single product from a source to several destinations
(B) A single product from several sources to several destinations
(C) A single product from several sources to a destination
(D) A multi-product from several sources to several destination
47. The assignment problem is a special case of transportation problem in which?
(A) Number of origins are less than the number of destinations
(B) Number of origins are greater than the number of destinations
(C) Number of origins are greater than or equal to the number of destinations
(D) Number of origins equals the number of destinations
48. If the primal problem has n constraints and m variables then the number of constraints in the dual problem is:
(A) mn
(B) $m+n$
(C) $m-n$
(D) m/n

49. _____ method is an alternative method of solving a Linear Programming Problem involving artificial variables.
- (A) Simplex method
 - (B) Big-M
 - (C) Dual simplex
 - (D) Graphical
50. To resolve degeneracy at the initial solution, a very small quantity is allocated in _____ cell.
- (A) Occupied
 - (B) Basic
 - (C) Non-basic
 - (D) Unoccupied
51. Feasible region in the set of points which satisfy?
- (A) The objective functions
 - (B) Some of the given constraints
 - (C) All of the given constraints
 - (D) None of these
52. Objective function of a linear programming problem is:
- (A) A constraint
 - (B) Function to be optimized
 - (C) A relation between the variables
 - (D) None of these

53. A set of values of decision variable which satisfies the linear constraints and non-negativity condition of a L.P.P. is called its
- (A) Unbounded solution
 - (B) Optimum solution
 - (C) Feasible solution
 - (D) None of these
54. Maximize $Z = 11x + 8y$ subject to $x \leq 4, y \leq 6, x + y \leq 6, x \geq 0, y \geq 0$.
- (A) 44 at (4, 2)
 - (B) 60 at (4, 2)
 - (C) 62 at (4, 0)
 - (D) 48 at (4, 2)
55. In transportation problem VAM stands for:
- (A) Value addition method
 - (B) Vogel approximation method
 - (C) Virgenean approximation method
 - (D) None of these
56. The transportation problem is basically:
- (A) Maximization model
 - (B) Minimization model
 - (C) Transshipment problem
 - (D) Iconic model
57. The column which is introduced in the matrix to balance the rim requirements, is known as?
- (A) Key column
 - (B) Idle column
 - (C) Slack column
 - (D) Dummy column

58. The Assignment Problem is solved by:
- (A) Complex method
 - (B) graphical Method
 - (C) Vector method
 - (D) Hungarian method
59. The assignment matrix is always a:
- (A) Rectangular matrix
 - (B) Square Matrix
 - (C) Identity matrix
 - (D) None of the above
60. In the North-West corner method allocations are made:
- (A) Starting from the left-hand side top corner
 - (B) Starting from the right-hand side top corner
 - (C) Starting from the lowest cost cell
 - (D) Starting from the lowest requirement and satisfying first
61. The Penalty of a row in a transportation problem is obtained by:
- (A) Deducting the smallest element in the row from all other elements of the row
 - (B) Adding the smallest element in the row to all other elements of the row
 - (C) Deducting the smallest element in the row from the next highest element in that row
 - (D) Deducting the smallest element in the row from the highest element in that row

62. In a transportation problem where the demand or requirement is equal to the available resource is known as:
- (A) Balanced transportation problem
 - (B) Regular transportation problem
 - (C) Resource allocation transportation problem
 - (D) Simple transportation model
63. When the total allocations in a transportation model of $m \times n$ size do not equal to $m + n - 1$ the situation is known as?
- (A) Unbalanced situation
 - (B) Tie situation
 - (C) Degeneracy
 - (D) None of the above
64. In the Hungarian method of solving an assignment problem, the row reduction is obtained by:
- (A) Dividing each row by the elements of the row above it
 - (B) Subtracting the elements of the row from the elements of the row above it
 - (C) Subtracting the smallest element from all other elements of the row
 - (D) Subtracting all the elements of the row from the highest element in the matrix
65. The total time required to complete all the jobs in a job sequencing problem is known as:
- (A) Processing time
 - (B) Waiting time
 - (C) Elapsed time
 - (D) Idle time

66. Graphical method is used if there are only _____ variables.
- (A) Four
 - (B) Three
 - (C) Two
 - (D) None of the above
67. Dual of the dual is:
- (A) Primal
 - (B) Dual
 - (C) Either dual or primal
 - (D) None of these
68. In the standard form of LPP all constraints are of _____ type.
- (A) Less than or equal to
 - (B) Greater than or equal to
 - (C) Equal to
 - (D) None of the above
69. The minimum number of lines covering all zeros in a reduced cost matrix of order n can be _____.
- (A) At least n
 - (B) At most n
 - (C) $n - 1$
 - (D) $n + 1$
70. In n job and two machines (say M_1 and M_2) sequencing problems with order of processing the jobs is $M_1 M_2$ _____.
- (A) Job having minimum time on machine M_2 is processed in the first
 - (B) Job having minimum time on machine M_2 is processed in the last
 - (C) Job having minimum time on machine M_1 is processed in the last
 - (D) Job having maximum time of machine M_2 is processed in the last

71. An LPP is defined as

$$\text{Minimize } Z = 15x_1 + 12x_2$$

subject to

$$x_1 + 2x_2 \leq 3$$

$$2x_1 - 4x_2 \leq 5$$

$$x_1, x_2 \geq 0$$

The objective function of the dual of this LPP is :

(A) Maximize $w = y_1 + y_2$

(B) Maximize $w = y_1 + 2y_2$

(C) Maximize $w = 2y_1 - 4y_2$

(D) Maximize $w = 3y_1 + 5y_2$

72. In the simplex method, the slack, surplus and artificial variables are:

(A) Multiplied

(B) Negative

(C) Non-negative

(D) Divided

73. In converting a less-than-or-equal constraint for use in a simplex table, we must add:

(A) A surplus variable

(B) A slack variable

(C) An artificial variable

(D) Both a surplus and a slack variable

74. Group replacement policy is most suitable for:

(A) Trucks

(B) Street light bulbs

(C) Machines

(D) New cars

75. The time period between placing an order its receipt in stock is known as:
- (A) Lead time
 - (B) Carrying time
 - (C) Shortage time
 - (D) Over time
76. The following classes of costs are usually involved in inventory decisions except:
- (A) Cost of ordering
 - (B) Carrying cost
 - (C) Cost of shortages
 - (D) machining cost
77. In replacement analysis the maintenance cost is a function of:
- (A) Time
 - (B) resale value
 - (C) Initial investment
 - (D) None of these
78. To resolve degeneracy at the initial solution, a very small quantity is allocated in_____.
- (A) Occupied
 - (B) Unoccupied
 - (C) No
 - (D) Finite
79. The optimum level of inventory is popularly referred to as the _____.
- (A) Minimum stock level
 - (B) Re-order stock level
 - (C) Economic order quantity
 - (D) None of these

80. In an assignment problem involving 5 workers and 5 jobs, total number of assignments possible are_____.
- (A) 5
 - (B) 10
 - (C) 15
 - (D) 20
81. The replacement policy that is imposed on an item irrespective of its failure is:
- (A) Group replacement
 - (B) Individual replacement
 - (C) Repair spare replacement
 - (D) Successive replacement
82. Johnson's rule is used for:
- (A) Queuing problem
 - (B) Sequencing problem
 - (C) Both (A) and (B)
 - (D) None of the above
83. Total time spend by a server with his customers is known as _____.
- (A) Utilization Factor
 - (B) Waiting time
 - (C) Traffic Intensity
 - (D) Both (A) and (C)
84. Who is known as father of queuing theory?
- (A) George Dantzig
 - (B) A. K. Erlang
 - (C) George Kendall
 - (D) Both (B) and (C)

85. Which of the following characteristics apply to the queuing system?
- (A) Customer population
 - (B) Arrival process
 - (C) Both (A) & (B)
 - (D) Neither (A) nor (B)
86. Customer behaviour in which the customer moves from one queue to another in a multiple channel, situation is
- (A) Balking
 - (B) Reneging
 - (C) Jockeying
 - (D) alternating
87. Server mechanism in a queuing system is characterized by:
- (A) Server Behaviour
 - (B) Customer behaviour
 - (C) Customer in the system
 - (D) All of the above
88. Priority queue may be classified as:
- (A) Finite or infinite
 - (B) Limited or unlimited
 - (C) Pre-emptive and non-pre-emptive
 - (D) All of the above
89. Sequencing is a subset of:
- (A) Routing
 - (B) Scheduling
 - (C) Expediting
 - (D) None of these

90. The time required for two operations cutting and binding of 5 jobs are as follows:

Job No	1	2	3	4	5
Cutting (min)	8	6	2	5	7
Binding (min)	8	7	7	6	4

What is the optimal sequence of scheduling the job?

- (A) 2-4-1-3-5
 - (B) 3-4-2-1-5
 - (C) 1-2-3-4-5
 - (D) 3-5-2-4-1
91. A minimization problem can be converted into a maximization problem by changing the sign of coefficient in the
- (A) Constraints
 - (B) Objective function
 - (C) Both (A) and (B)
 - (D) None of the above
92. Group replacement policy applies to:
- (A) Irreparable items
 - (B) Repairable items
 - (C) Items that fail partially
 - (D) Items that fail completely and suddenly
93. If a machine becomes old, then the failure rate expected will be:
- (A) Constant
 - (B) Increasing
 - (C) Decreasing
 - (D) We cannot say
94. Replacement is said to be necessary if:
- (A) Failure rate is increasing
 - (B) Failure cost is increasing
 - (C) Failure probability is increasing
 - (D) Any of these

95. Which of the following is the correct assumption for replacement policy when money value does not change with time?
- (A) No capital cost
 - (B) No scrap value
 - (C) Constant scrap value
 - (D) Zero maintenance cost
96. The following classes of costs are usually involve in inventory decisions except:
- (A) Cost of ordering
 - (B) Carrying cost
 - (C) Cost of shortages
 - (D) Machining cost
97. The order cost per order of an inventory is Rs. 400 with an annual carrying cost of Rs. 10 per unit. The Economic Order quantity (EOQ) for an annual demand of 2000 units is :
- (A) 400
 - (B) 440
 - (C) 480
 - (D) 500
98. Which of the following is not an inventory?
- (A) Machines
 - (B) Raw material
 - (C) Finished products
 - (D) Consumable tool
99. A feasible solution to an LP problem:
- (A) Must satisfy all of the problem's constraints simultaneously
 - (B) Need not satisfy all of the constraints, only some of them
 - (C) Must be a corner point of the feasible region
 - (D) Must optimize the value of the objective function
100. Traffic intensity is given by:
- (A) Mean arrival rate/mean service rate
 - (B) $\lambda \times \mu$
 - (C) μ/λ
 - (D) Number present in the queue/Number served

DO NOT OPEN THE QUESTION BOOKLET UNTIL ASKED TO DO SO

1. Examinee should enter his / her roll number, subject and Question Booklet Series correctly in the O.M.R. sheet, the examinee will be responsible for the error he / she has made.
 2. **This Question Booklet contains 100 questions, out of which only 75 Question are to be Answered by the examinee. Every question has 4 options and only one of them is correct. The answer which seems correct to you, darken that option number in your Answer Booklet (O.M.R ANSWER SHEET) completely with black or blue ball point pen. If any examinee will mark more than one answer of a particular question, then the answer will be marked as wrong.**
 3. Every question has same marks. Every question you attempt correctly, marks will be given according to that.
 4. Every answer should be marked only on Answer Booklet (O.M.R ANSWER SHEET). Answer marked anywhere else other than the determined place will not be considered valid.
 5. Please read all the instructions carefully before attempting anything on Answer Booklet **(O.M.R ANSWER SHEET)**.
 6. After completion of examination, please hand over the **O.M.R. SHEET** to the Examiner before leaving the examination room.
 7. There is no negative marking.
- Note:** On opening the question booklet, first check that all the pages of the question booklet are printed properly in case there is an issue please ask the examiner to change the booklet of same series and get another one.