

Roll No. ....

Question Booklet Number

O. M. R. Serial No.

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Question Booklet Number
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## B. C. A. (Fourth Semester) EXAMINATION, 2022-23

### OPTIMIZATION TECHNIQUES

Paper Code						
B	C	A	4	0	4	N

Questions Booklet Series
<b>A</b>

Time : 1:30 Hours ]

[ Maximum Marks : 75

#### Instructions to the Examinee :

परीक्षार्थियों के लिए निर्देश :

- Do not open the booklet unless you are asked to do so.
  - 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.
  - 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.
- प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।
  - 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।
  - 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 गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(Remaining instructions on the last page)

(शेष निर्देश अन्तिम पृष्ठ पर)

***(Only for Rough Work)***

1. In operations research, the ..... are prepared for situations.
  - (A) mathematical models
  - (B) physical models diagrammatic
  - (C) diagrammatic models
  - (D) None of the above
  
2. Which of the following is not the phase of OR methodology ?
  - (A) Formulating a problem
  - (B) Constructing a model
  - (C) Establishing controls
  - (D) Controlling the environment
  
3. Operations research is the application of ..... methods to arrive at the optimal solutions to the problems.
  - (A) economical
  - (B) scientific
  - (C) Both (A) and (B)
  - (D) artistic
  
4. Which technique is used in finding a solution for optimizing a given objective, such as profit maximization or cost reduction under certain constraints ?
  - (A) Queuing Theory
  - (B) Waiting Line
  - (C) Both (A) and (B)
  - (D) Linear Programming
  
5. The operations research technique which helps in minimizing total waiting and service costs is ..... ..
  - (A) Queuing Theory
  - (B) Decision Theory
  - (C) Both (A) and (B)
  - (D) None of the above
  
6. In graphical representation the bounded region is known as ..... region.
  - (A) solution
  - (B) basic solution
  - (C) feasible solution
  - (D) optimal
  
7. 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)
  
8. The occurrence of degeneracy while solving a transportation problem means that :
  - (A) total supply equals total demand
  - (B) the solution so obtained is not feasible
  - (C) the few allocations become negative
  - (D) None of the above

9. 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
10. The solution to a transportation problem with ' $m$ ' rows (supplies) and ' $n$ ' columns (destination) is feasible if number of positive allocations are :
- (A)  $m + n$
  - (B)  $m * n$
  - (C)  $m + n - 1$
  - (D)  $m + n + 1$
11. 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
12. The minimum number of line 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)  $n + 1$
13. One disadvantage of using North-West Corner Rule to find initial solution to the transportation problem is that :
- (A) It is complicated to use
  - (B) It does not take into account cost of transportation
  - (C) It leads to a degenerate initial solution
  - (D) All of the above
14. The unused materials are returned to stores with a material and ..... note.
- (A) Acceptance
  - (B) Transfer
  - (C) Return
  - (D) None of the above
15. 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 the above
16. Which of the following is not an inventory ?
- (A) Machines
  - (B) Raw Material
  - (C) Finished Products
  - (D) Consumable tools

17. 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
18. Customer behaviour in which the customer moves from one queue to another in a multiple channel situation is :
- (A) balking
  - (B) renegeing
  - (C) jockeying
  - (D) alternating
19. 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
20. If a job is having minimum processing time under both the machines, then the job is placed in :
- (A) any one (first or last) position
  - (B) available last position
  - (C) available first position
  - (D) Both first and last position
21. In a transportation problem, the method which finds difference between two least cost for each row and column is .....
- (A) Minimum entry method
  - (B) North-west corner method
  - (C) North-east corner method
  - (D) VAM method
22. In simplex method, we add ..... in the case of constraints with sign “=”.
- (A) Surplus variable
  - (B) Artificial variable
  - (C) Slack variable
  - (D) None of the above
23. As the order quantity increases, this cost will reduce :
- (A) ordering cost
  - (B) insurance cost
  - (C) inventory carrying cost
  - (D) stock out cost
24. LOB stands for :
- (A) Lot of Bills
  - (B) Lot of Batches
  - (C) Line of Batches
  - (D) Line of Business

25. 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.
26. The large negative opportunity cost value in an unused cell in a transportation table is chosen to improve the current solution because :
- (A) It represents per unit cost reduction
  - (B) It represents per unit cost improvement
  - (C) It ensure no rim requirement violation
  - (D) None of the above
27. If an opportunity cost value is used for an unused cell to test optimality, it should be .....
- (A) Equal to zero
  - (B) Most negative number
  - (C) Most positive number
  - (D) Any value
28. Queuing theory deals with the problem of :
- (A) Material handling
  - (B) Reducing waiting time or idle time
  - (C) Better utilization of man services
  - (D) Effective use of machines
29. .... is that element of the simplex table which is both in the key row and key column.
- (A) Key element
  - (B) Pivot element
  - (C) Both (A) and (B)
  - (D) None of the above
30. Traffic intensity is computed by using the formula :
- (A)  $\lambda/\mu$
  - (B)  $\mu/\lambda$
  - (C)  $1-\lambda/\mu$
  - (D)  $1-\mu/\lambda$
31. Matrix Minima Method to find initial feasible solution to a TP is also called .....
- (A) NWCM
  - (B) LCM
  - (C) VAM
  - (D) None of the above

32. Traffic intensity in Queuing Theory is also called .....
- (A) Service factor
  - (B) Arrival factor
  - (C) Utilisation factor
  - (D) None of the above
33. A customer's behaviour of leaving the queue due to impatience is called .....
- (A) Jockeying
  - (B) Reneging
  - (C) Collusion
  - (D) Balking
34. Commonly assumed probability distribution of service pattern are .....
- (A) Poisson distribution
  - (B) Exponential distribution
  - (C) Erlang distribution
  - (D) Both (B) and (C)
35. A LPP model does not contain :
- (A) Decision
  - (B) Constraints
  - (C) Feasible solution
  - (D) Spreadsheet
36. In sequencing if the smallest time belong to machine-1, then that job has to be placed ..... of the sequence.
- (A) in the middle
  - (B) in the starting
  - (C) at end
  - (D) None of the above
37. 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 the above
38. In the formula of Economic Order Quantity, the alphabet 'O' stands for .....
- (A) Ordering Level
  - (B) Ordering Cost
  - (C) Ordering and Carrying Cost
  - (D) None of the above
39. What is the first approach in optimization methods ?
- (A) Theory of bending
  - (B) Theory of layout
  - (C) Theory of elongation
  - (D) Theory of stress

40. Initial feasible solution to a transportation problem can be found out by .....
- (A) VAM  
 (B) MODI Method  
 (C) Both (A) and (B)  
 (D) None of the above
41. It is assumed that maintenance cost mostly depends on :
- (A) Calendar age  
 (B) Running age  
 (C) Manufacturing date  
 (D) User's age
42. 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
43. 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 zeros  
 (C) when there is a tie between zero opportunity cost cells  
 (D) if two diagonal elements are zeros.
44. 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
45. In the optimal simplex table,  $Z_j - C_j = 0$  value indicates .....
- (A) alternative solution  
 (B) bounded solution  
 (C) infeasible solution  
 (D) unbounded solution
46. When  $D = 18000$ , holding cost = ₹ 1.20, set-up cost = ₹ 400,  $EOQ = \dots\dots\dots$
- (A) 3465  
 (B) 3750  
 (C) 3500  
 (D) 4000
47. When the probability of failure reduces gradually, the failure mode is said to be :
- (A) Regressive  
 (B) Retrogressive  
 (C) Progressive  
 (D) Recursive

48. When money value changes with time at 10%, then PWF for first year is :
- (A) 1
  - (B) 0.909
  - (C) 0.852
  - (D) 0.9
49. The unit of traffic intensity is .....
- (A) Poisson
  - (B) Markow
  - (C) Erlang
  - (D) Kendall
50. If the operating characteristics of a queue are dependent on time, then it is said to be :
- (A) Transient state
  - (B) Busy state
  - (C) Steady state
  - (D) Explosive state
51. As per queue discipline is the following is not the negative behavior of customer :
- (A) Balking
  - (B) Reneging
  - (C) Boarding
  - (D) Collusion
52. The method used to solve LPP with use of artificial variables is called .....
- (A) Dual Simplex
  - (B) Graphical
  - (C) Big-M
  - (D) Transportation Problem
53. Which of the followings is an assumption of Linear Programming Technique ?
- (A) Divisibility
  - (B) Additivity
  - (C) Proportionality
  - (D) All of the above
54. During an iteration while moving from one solution to the next, degeneracy may occur when :
- (A) The closed path indicates a diagonal move
  - (B) Two or more occupied cells are on the closed path but neither of them represents a corner of the path.
  - (C) Two or more occupied cells on the closed path with minus sign are tied for lowest circled value
  - (D) Either of the above
55. The smallest quantity is chosen at the corners of the closed path with negative sign to be assigned at unused cell because :
- (A) It improve the total cost
  - (B) It does not disturb rim conditions
  - (C) It ensure feasible solution
  - (D) All of the above

56. The occurrence of degeneracy while solving a transportation problem means that .....
- (A) total supply equals total demand
  - (B) the solution so obtained is not feasible
  - (C) the few allocations become negative
  - (D) None of the above
57. In maximization problem, optimal solution occurring at corner point yields the :
- (A) mean values of  $z$
  - (B) highest value of  $z$
  - (C) lowest value of  $z$
  - (D) mid values of  $z$
58. Column in simplex initial table used to represent new basic variable is classified as .....
- (A) column variable
  - (B) key column
  - (C) key row
  - (D) row variable
59. In simplex method, slack, surplus and artificial variables are restricted to be .....
- (A) multiplied
  - (B) negative
  - (C) non-negative
  - (D) divided
60. In simplex method basic solution set as  $(n - m)$ , all variables other than basic are classified as .....
- (A) constant variable
  - (B) non-positive variables
  - (C) basic variables
  - (D) non-basic variable
61. In simplex method, we add variables in the case of '='
- (A) Slack Variable
  - (B) Surplus Variable
  - (C) Artificial Variable
  - (D) None of the above
62. .... is another method to solve a given LPP involving some artificial variable.
- (A) MODI method
  - (B) Method of penalties
  - (C) Two-phase simplex method
  - (D) None of the above
63. In transportation models designed in linear programming, points of demand is classified as .....
- (A) ordination
  - (B) transportation
  - (C) destinations
  - (D) origins

64. In less than or equal to constraint equations, variable which is used to balance both side of equations is classified as .....
- (A) solving variable
  - (B) condition variable
  - (C) slack variable
  - (D) positive variable
65. If in a LPP, the solution of a variable can be made infinity large without violating the constraints, the solution is .....
- (A) Infeasible
  - (B) Unbounded
  - (C) Alternative
  - (D) None of the above
66. A BFS of a LPP is said to be ..... if at least one of the basic variable is zero.
- (A) Degenerate
  - (B) Non-degenerate
  - (C) Infeasible
  - (D) Unbounded
67. 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

68. 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
69. Cells in the transportation problem having positive allocation will be called .....
- (A) cells
  - (B) occupied
  - (C) unoccupied
  - (D) table
70. The time required for two operations cutting and binding of 5 jobs are as follows :

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

71. Sequencing is a subset of :
- (A) Routing
  - (B) Scheduling
  - (C) Expediting
  - (D) None of the above
72. .... are expressed in the form of inequities or equations.
- (A) Constraints
  - (B) Objective Functions
  - (C) Both (A) and (B)
  - (D) None of the above
73. The objective, functions and constraints are linear relationship between .....
- (A) Variables
  - (B) Constraints
  - (C) Functions
  - (D) All of the above
74. Graphic method can be applied to solve a LPP when there are only ..... variable.
- (A) One
  - (B) More than one
  - (C) Two
  - (D) Three
75. In LPP, degeneracy occurs in ..... stages.
- (A) One
  - (B) Two
  - (C) Three
  - (D) Four
76. If there are more than one optimum solution for the decision variable the solution is .....
- (A) Infeasible
  - (B) Unbounded
  - (C) Alternative
  - (D) None of the above
77. An optimization model :
- (A) Mathematically provides the best decision
  - (B) Provides decision within its limited context
  - (C) Helps in evaluating various alternatives constantly
  - (D) All of the above
78. The word "Linear" means that the relationships are represented by .....
- (A) Diagonal lines
  - (B) Curved lines
  - (C) Straight lines
  - (D) Slanting lines

79. Any feasible solution which optimizes (minimizes or maximizes) the objective function of the LPP is called its .....
- (A) Optimal solution
  - (B) Non-basic variables
  - (C) Solution
  - (D) Basic feasible solution
80. A set of values  $X_1, X_2, \dots, X_n$  which satisfies the constraints of the LPP is called .....
- (A) Solution
  - (B) Variable
  - (C) Linearity
  - (D) None of the above
81. An objective function is maximized when it is a ..... function.
- (A) Passive
  - (B) Profit
  - (C) Cost
  - (D) None of the above
82. PP is exactly used in solving what kind of resource allocation problems ?
- (A) Production planning and scheduling
  - (B) Transportation
  - (C) Sales and advertising
  - (D) All of the above
83. .... which is a subclass of a Linear Programming Problem (LPP).
- (A) Programming problem
  - (B) Transportation problem
  - (C) Computer problem
  - (D) Both (A) and (B)
84. MODI method is used to obtain .....
- (A) Optimal solutions
  - (B) Optimality test
  - (C) Both (A) and (B)
  - (D) Optimization
85. For solving an assignment problem, which method is used ?
- (A) Hungarian
  - (B) American
  - (C) German
  - (D) Both (A) and (B)
86. To make an unbalanced assignment problem balanced, what are added with all entries as zeroes ?
- (A) Dummy rows
  - (B) Dummy columns
  - (C) Both (A) and (B)
  - (D) Dummy entries

87. Any feasible solution to a transportation problem containing  $m$  origins and  $n$  destinations is said to be .....
- (A) Independent
  - (B) Degenerate
  - (C) Non-degenerate
  - (D) Both (A) and (B)
88. A path formed by allowing horizontal and vertical lines and the entire corner cells of which are occupied is called a .....
- (A) Occupied path
  - (B) Open path
  - (C) Closed path
  - (D) None of the above
89. Once the initial basic feasible solution has been computed, what is the next step in the problem ?
- (A) VAM
  - (B) Modified distribution method
  - (C) Optimality test
  - (D) None of the above
90. Server mechanism in a queuing system is characterised by :
- (A) Server behaviour
  - (B) Customer behaviour
  - (C) Customer in the system
  - (D) All of the above
91. The variables whose coefficient vectors are unit vectors are called .....
- (A) Unit Variables
  - (B) Basic Variables
  - (C) Non-basic Variables
  - (D) None of the above
92. 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
93. Cars arrive at a service station according to Poisson'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) 20 minutes
  - (C) 25 minutes
  - (D) 50 minutes

94. The time period between placing an order its receipt in stock is known as .....
- (A) Lead time
  - (B) Carrying time
  - (C) Shortage time
  - (D) Overtime
95. 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
96. Johnson's rule is used for .....
- (A) Queuing problem
  - (B) Sequencing problem
  - (C) Both (A) and (B)
  - (D) None of the above
97. Who is known as father of queuing theory ?
- (A) George Dantzig
  - (B) A. K. Erlang
  - (C) George Kendall
  - (D) Both (B) and (C)
98. Which of the following characteristics apply to the queuing system ?
- (A) customer population
  - (B) arrival process
  - (C) Both (A) and (B)
  - (D) Neither (A) nor (B)
99. For analysing the problem, decision-makers should normally study :
- (A) Its qualitative aspects
  - (B) Its quantitative aspects
  - (C) Both (A) and (B)
  - (D) Neither (A) nor (B)
100. In simplex method, if there is tie between a decision variable and a slack (or surplus) variable, ..... should be selected.
- (A) Slack variable
  - (B) Surplus variable
  - (C) Decision variable
  - (D) None of the above

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 :

**Example :**

**Question :**

Q. 1 (A) ● (C) (D)

Q. 2 (A) (B) ● (D)

Q. 3 (A) ● (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

**Impt. :** On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छँटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ● (C) (D)

प्रश्न 2 (A) (B) ● (D)

प्रश्न 3 (A) ● (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

**महत्वपूर्ण :** प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।