

Roll No.

O. M. R. Serial No.

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Question Booklet Number

353742

B. B. A. (Fourth Semester) EXAMINATION, 2022-23

OPERATIONS RESEARCH

Paper Code

B	B	A	4	0	6	N
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Time : 1:30 Hours]

Questions Booklet
Series

B

[Maximum Marks : 75

Instructions to the Examinee :

परीक्षार्थियों के लिए निर्देश :

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.
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 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)

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1. Dual of the dual is the :
 - (A) Primal
 - (B) Dual
 - (C) Either primal or dual
 - (D) None of these
2. Multiple solutions in LLPs indicate that :
 - (A) More than one solution is available for different objective functions values
 - (B) Two solutions are available satisfying all constraints
 - (C) More than one solution is available for the same objective function value
 - (D) No solution is available satisfying all the constraints
3. In linear programming, dual price represents :
 - (A) Mean and maximum price
 - (B) Unit worth of a resource
 - (C) Minimum and mean price
 - (D) Minimum and maximum price
4. We add a surplus variable for of constraint.
 - (A) " $\leq$ "
 - (B) " $\geq$ "
 - (C) " $=$ "
 - (D) " $\neq$ "
5. The right-hand side element of each constraint is
 - (A) Negative
 - (B) Non-Negative
 - (C) Zero
 - (D) Absolute
6. A basic solution is said to be a feasible solution if it all constraints.
 - (A) Dissatisfies
 - (B) Satisfies
 - (C) Equals
 - (D) Cancel
7. If one or more values of the basic variable are zero then the solution is said to be
 - (A) Non-Degenerate
 - (B) Degenerate
 - (C) Primal
 - (D) Dual
8. The penalty for not taking correct decision is known as :
 - (A) Fine
 - (B) Loss
 - (C) Cost
 - (D) Opportunity cost

9. The initial solution of a transportation problem can be obtained by applying any known method. However, the only condition is that :
- the solution be optimal
 - the solution not be degenerate
 - the rim condition are satisfied
 - all of the above
10. In a transportation problem, when the number of occupied routes is less than the number of rows plus the number of columns -1 , we say that the solution is :
- Unbalanced
 - Infeasible
 - Optimal
 - Degenerate
11. The degeneracy in the transportation problem indicates that :
- The multiple optimal solution exist
 - Dummy allocation(s) needs to be added
 - The problem has no feasible solution
 - Both (B) & (C) but not (A)
12. The Assignment Problem is solved by :
- Complex method
 - Graphical method
 - Vector method
 - Hungarian method
13. In the Hungarian method of solving an assignment problem, the row reduction is obtained by :
- Dividing each row by the elements of the row above it
 - Subtracting the elements of the row from the elements of the row above it
 - Subtracting the smallest element from all other elements of the row
 - Subtracting all the elements of the row from the highest element in the matrix
14. The assignment matrix is always a/an :
- Rectangular matrix
 - Square matrix
 - Identity matrix
 - None of the above
15. What is a critical path ?
- It is a path that operates from the starting node to the end node.
 - It is a mixture of all the paths
 - It is the longest path
 - It is the shortest path

16. What happens when a project is scheduled by CPM ?
- (A) A project is divided into various activities
 - (B) Required time for each activity is established
 - (C) A sequence of various activities is made according to the importance
 - (D) All of the above
17. In a network, one activity may connect any nodes.
- (A) one
 - (B) two
 - (C) three
 - (D) number of
18. The full form of PERT is
- (A) Program Evaluation and Rate Technology
 - (B) Program Evaluation and Robot Technique
 - (C) Program Evaluation and Robot Technology
 - (D) Program Evaluation and Review Technique
19. Activities P, Q, and R are the immediate predecessors for activity S. If the earliest finishing time for the three activities are 10, 14, and 16, then what will be the earliest starting time for S ?
- (A) 14
 - (B) 16
 - (C) 10
 - (D) Cannot be determined
20. are used to represent activity in a network diagram.
- (A) Circles
 - (B) Squares
 - (C) Rectangles
 - (D) Arrows
21. Activities that cannot be started until one or more of the other activities are completed, are called :
- (A) Successor activities
 - (B) Initial activities
 - (C) Dummy activities
 - (D) Predecessor activities
22. The duration by which an activity can be delayed without delaying the completion of the project is known as :
- (A) Earliest Start Time
 - (B) Earliest Finish Time
 - (C) Latest Start Time
 - (D) Latest Finish Time

23. In models there is risk and uncertainty.
- (A) Deterministic
 - (B) Probabilistic
 - (C) Both (A) and (B)
 - (D) None of the above
24. Critical Path Method is good for :
- (A) small projects only
 - (B) large projects only
 - (C) both small and large projects
 - (D) neither small nor large projects
25. In models, everything is defined and the results are certain.
- (A) Deterministic
 - (B) Probabilistic
 - (C) Both (A) and (B)
 - (D) None of the above
26. It is not easy to make any modification or improvement in :
- (A) Iconic models
 - (B) Analogue models
 - (C) Symbolic models
 - (D) None of the above
27. Models assumes that the values of the variables do not change with time during a particular period :
- (A) Dynamic models
 - (B) Static models
 - (C) Both (A) and (B)
 - (D) None of the above
28. Which technique is used in finding a solution for optimizing a given objective, such as profit maximization or cost minimization under certain constraints ?
- (A) Queuing theory
 - (B) Waiting line
 - (C) Linear Programming
 - (D) None of the above
29. Both transportation and assignment problems are members of a category of LP problems called
- (A) Shipping problems
 - (B) Logistics problems
 - (C) Network flow problems
 - (D) Generalized flow problems
30. Which of the following is a method for improving an initial solution in a transportation problem ?
- (A) Northwest-corner
 - (B) Intuitive lowest-cost
 - (C) Southeast-corner rule
 - (D) Stepping-stone
31. Optimal solution of an assignment problem can be obtained only if :
- (A) Each row and column has only one zero element
 - (B) Each row and column has at least one zero element
 - (C) The data is arrangement in a square matrix
 - (D) None of the above

32. In assignment problem of maximization, the objective is to maximise :
- Profit
 - Optimization
 - Cost
 - None of the above
33. What is the difference between minimal cost network flows and transportation problems ?
- The minimal cost network flows are special cases of transportation problems.
 - The transportation problems are special cases of the minimal cost network flows.
 - There is no difference.
 - The transportation problems are formulated in terms of tableaux, while the minimal cost Network flows are formulated in terms of graphs.
34. The transportation method assumes that :
- There are no economies of scale if large quantities are shipped from one source to one destination.
 - The number of occupied squares in any solution must be equal to the number of rows in the table plus the number of columns in the table plus 1.
 - There is only one optimal solution for each problem.
 - The number of dummy sources equals the number of dummy destinations
35. In a transportation problem, we must make the number of and equal.
- destinations; sources
 - units supplied; units demanded
 - columns; rows
 - positive cost coefficients; negative cost coefficients
36. or are used to "balance" an assignment or transportation problem.
- Units supplied; units demanded
 - Large cost coefficients; small cost coefficients
 - Artificial cells; degenerate cells
 - Dummy rows; dummy columns
37. The equation $R_i + K_j = C_{ij}$ is used to calculate
- an improvement index for the stepping-stone method
 - the opportunity, costs for using a particular route
 - the MODI cost values (R_i, K_j)
 - the degeneracy index

38. 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
39. 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 solution not be degenerate
 - (C) The rim condition are satisfied
 - (D) All of the above
40. The objective of network analysis is to
- (A) minimize total project duration
 - (B) Minimize total project cost
 - (C) minimize production delays, interruption and conflicts
 - (D) maximize total project duration
41. " $\leq$ " constraint changes to type in dual LP.
- (A) " $\geq$ "
 - (B) " $\leq$ "
 - (C) " $\neq$ "
 - (D) "O"
42. The assignment matrix is always a/an :
- (A) Rectangular matrix
 - (B) Square matrix
 - (C) Identity matrix
 - (D) None of the above
43. Operation research approach is :
- (A) Multi-disciplinary
 - (B) Artificial
 - (C) Intuitive
 - (D) All of the above
44. Mathematical model of Linear Programming is important because :
- (A) it helps in converting the verbal description and numerical data into mathematical expression
 - (B) decision makers prefer to work with formal models.
 - (C) it captures the relevant relationship among decision factors.
 - (D) it enables the use of algebraic techniques.

45. A constraint in an LP model restricts :
- value of the objective function
 - value of the decision variable
 - use of the available resources
 - All of the above
46. In graphical method of linear programming problem if the ISO-cost line coincide with a side of region of basic feasible solutions we get :
- unique optimum solution
 - unbounded optimum solution
 - no feasible solution
 - infinite number of optimum solutions
47. A feasible solution of LPP :
- Must satisfy all the constraints simultaneously
 - Need not satisfy all the constraints, only some of them
 - Must be a corner point of the feasible region
 - All of the above
48. The objective function for a L.P model is $3x_1 + 2x_2$, if $x_1 = 20$ and $x_2 = 30$, what is the value of the objective function ?
- 0
 - 50
 - 60
 - 120
49. Maximization of objective function in LPP means :
- Value occurs at allowable set decision
 - Highest value is chosen among allowable decision
 - None of the above
 - All of the above
50. Alternative solution exist in a linear programming problem when :
- one of the constraint is redundant
 - objective function is parallel to one of the constraints
 - two constraints are parallel
 - All of the above
51. The linear function of the variables which is to be maximize or minimize is called :
- Constraints
 - Objective function
 - Decision variable
 - None of the above

52. The true statement for the graph of inequations $3x + 2 \leq 6$ and $6x + 4 \geq 20$, is :
- Both graphs are disjoint
 - Both do not contain origin
 - Both contain point (1, 1)
 - None of the above
53. The value of objective function is maximum under linear constraints :
- the center of feasible region
 - At (0,0)
 - At any vertex of feasible region
 - The vertex which is at maximum distance from (0, 0)
54. If the value of the objective function "z" can be increased or decreased indefinitely, such solution is called :
- Bounded solution
 - Unbounded solution
 - Solution
 - None of the above
55. A type of decision-making environment is :
- certainty
 - uncertainty
 - risk
 - All of the above
56. Which of the following criterion is not used for decision-making under uncertainty ?
- maximin
 - maximax
 - minimax
 - minimize expected loss
57. Decision theory is concerned with :
- methods of arriving at an optimal decision
 - selecting optimal decision in a sequential manner
 - analysis of information that is available
 - All of the above
58. Which of the following criterion is not applicable to decision-making under risk ?
- Maximize expected return
 - Maximize return
 - Minimize expect regret
 - Knowledge of likelihood occurrence of each state of nature
59. The expected value of perfect information (EVPI) is :
- equal to expected regret of the optimal decision under risk
 - the utility of additional information
 - maximum expected opportunity loss
 - None of the above

60. The minimum expected opportunity loss (EOL) is :
- (A) equal to EVPI
 - (B) minimum regret
 - (C) equal to EMV
 - (D) Both (A) and (B)
61. The value of the coefficient of optimism (a) is needed while using the criterion of :
- (A) equally likely
 - (B) maximin
 - (C) realism
 - (D) minimax
62. The difference between the expected profit under conditions of risk and the expected profit with perfect information is called :
- (A) the expected value of perfect information
 - (B) expected marginal loss
 - (C) Both of the above
 - (D) None of the above
63. The difference between the expected profit under conditions of risk and the expected profit with perfect information is called :
- (A) The expected value of perfect information
 - (B) Expected marginal loss
 - (C) Both of the above
 - (D) None of the above
64. The concept of utility is used to :
- (A) Measure the utility of money
 - (B) Take into account aversion of risk
 - (C) Both (A) and (B)
 - (D) None of the above
65. The expected value of perfect information is equal to :
- (A) $EPPI - \text{Min (EMV)}$
 - (B) $EPPI + \text{Max (EMV)}$
 - (C) Max. (EOL)
 - (D) None of the above
66. Essential characteristics of a decision model are :
- (A) states of nature
 - (B) decision alternatives
 - (C) payoff
 - (D) All of the above

67. While using Hurwitz criterion, the coefficient of realism :
- (A) represents the degree of optimism
 - (B) represents the degree of pessimism
 - (C) is the probability of a state of nature
 - (D) None of the above
68. In decision making under there are several possible outcomes for each alternative, and the decision maker knows the probability of occurrence of each outcome.
- (A) risk
 - (B) utility
 - (C) certainty
 - (D) probability
69. Expected monetary value (EMV) is :
- (A) the average or expected monetary outcome of a decision if it can be repeated a large number of times.
 - (B) the average or expected value of the decision, if you know what would happen ahead of time.
 - (C) the average or expected value of information if it were completely accurate.
 - (D) the amount you would lose by not picking the best alternative
70. Dual LPP always reduces the amount of computation :
- (A) Yes
 - (B) No
 - (C) Can't say
 - (D) Impossible
71. The coefficients of decision variables in the objective function become quantities on the right-hand side of
- (A) Dual
 - (B) Primal
 - (C) Coefficient
 - (D) Equal
72. The collection of all feasible solutions is known as the region.
- (A) Infeasible
 - (B) Feasible
 - (C) Bounded
 - (D) Saturated
73. Transportation problem develops a schedule at
- (A) Finite cost
 - (B) Infinite cost
 - (C) Minimum cost
 - (D) Maximum cost
74. Hungarian method cannot be applied directly to problem.
- (A) Minimization
 - (B) Complex
 - (C) Maximization
 - (D) Unbalanced

75. Which of the following is true about Operations Research ?
- (A) Operations Research is an interdisciplinary team approach
 - (B) Operations Research increases the creative ability of the decision maker
 - (C) Both (A) and (B)
 - (D) None of the above
76. The term "Operation Research" was coined by :
- (A) Mc Closky and Trefthen
 - (B) Arthur Clark
 - (C) Churchman, Ackoff and Arnoff
 - (D) George B Dantzig
77. The innovative science of Operations Research was discovered during :
- (A) Civil war
 - (B) World war I
 - (C) World war II
 - (D) Industrial Revolution
78. In India, first Operations Research unit was set up at :
- (A) Regional Research Laboratory, Hyderabad
 - (B) Indian Statistical Institute, Kolkata
 - (C) Indian Institute of Science and Technology, Bengaluru
 - (D) Indian Institute of Science and Technology, Mohali
79. Who defined Operations Research as "the art of giving bad answers to problems which otherwise have worse answers" ?
- (A) H M Wagner
 - (B) H A Taha
 - (C) T L Saaty
 - (D) Arthur Clark
80. The main objective of OR is to provide a to the decision-makers.
- (A) Scientific basis
 - (B) Objective basis
 - (C) Subjective basis
 - (D) Mathematic basis
81. Diagram belongs to the model.
- (A) Physical
 - (B) Chemical
 - (C) Biological
 - (D) Scientific
82. Applications of OR in :
- (A) Hospital
 - (B) Traffic
 - (C) Army
 - (D) All of Above

83. In graphical representation the bounded region is known as region.
- (A) solution
 - (B) basic solution
 - (C) feasible solution
 - (D) optimal
84. OR increases the effectiveness of ability.
- (A) Decision making
 - (B) Problem making
 - (C) Money making
 - (D) Marketing
85. Linear programming is the tool of
- (A) Mathematics
 - (B) Statistics
 - (C) OR
 - (D) None of the Above
86. The phases of OR are
- (A) Judgement phase
 - (B) Research phase
 - (C) Action phase
 - (D) All of the above
87. To solve any problem through the OR approach the first step is
- (A) Solve the problem
 - (B) Define the problem
 - (C) Develop solution
 - (D) Develop model
88. represents a real-life system.
- (A) Diagram
 - (B) Model
 - (C) Graphs
 - (D) Numerical
89. represents the controlled variables of the system.
- (A) Parameters
 - (B) Scale
 - (C) Constraints
 - (D) Income
90. Both the objective function and constraints are expressed in forms.
- (A) Linear
 - (B) Dynamic
 - (C) Simple
 - (D) Complex
91. OR methodology consists of :
- (A) Definition
 - (B) Solution
 - (C) Validation
 - (D) None of the above
92. A linear inequality in two variables is known as a
- (A) Half-plan
 - (B) Full-plan
 - (C) Partial-plan
 - (D) Convex-plan

93. The feasible region is a set.
- (A) Concave
 - (B) Convex
 - (C) Orthogonal
 - (D) Plane
94. The optimum value occurs the anywhere region.
- (A) Feasible
 - (B) Infeasible
 - (C) Unbounded
 - (D) Saturated
95. Operations Research approach is
- (A) multi-disciplinary
 - (B) scientific
 - (C) intuitive
 - (D) collect essential data
96. The objective function for a minimization problem is given by $Z = 2p - 5q + 3r$. The Hyper plane for the objective function cuts a bounded feasible region in the space (p,q,r). Find the direction vector d, where a finite optimal solution can be reached.
- (A) d (2,-5,3)
 - (B) d (-2, 5,-3)
 - (C) d (2, 5, 3)
 - (D) d (-2, -5, -3)
97. An iso-profit contour represents :
- (A) an infinite no. of feasible points, all of which yield the same profit.
 - (B) an infinite no. of optimal solutions
 - (C) an infinite no. of decisions, all of which yield the same profit.
 - (D) All of the above
98. All variables in the solution of LPP are either positive or zero due to the existence of :
- (A) An objective function
 - (B) Structural constraints
 - (C) Limited resources
 - (D) None of the above
99. The non-negativity requirement is included in an LP because :
- (A) it makes the model easier to solve
 - (B) it makes the model correspond closer to the real-world problem
 - (C) Both (A) and (B)
 - (D) None of the above
100. Artificial variables are used :
- (A) To find an initial solution
 - (B) In phase 1 of two-phase method
 - (C) To find optimal dual prices in the final table
 - (D) All 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) ☒ (B) ☐ (C) ☐ (D) ☐

Q.2 (A) ☐ (B) ☒ (C) ☐ (D) ☐

Q.3 (A) ☐ (B) ☒ (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 छोटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ☒ (B) ☐ (C) ☐ (D) ☐

प्रश्न 2 (A) ☐ (B) ☒ (C) ☐ (D) ☐

प्रश्न 3 (A) ☐ (B) ☒ (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 सिरिज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।