OPERATIONS RESEARCH

Multiple Choice Questions

1. Operations research is the application of ____________methods to arrive at the optimal Solutions to the problems.
   A. economical
   B. scientific
   C. a and b both
   D. artistic

2. In operations research, the ----------------------------are prepared for situations.
   A. mathematical models
   B. physical models diagrammatic
   C. diagrammatic models

3. Operations management can be defined as the application of --to a problem within a system to yield the optimal solution.
   A. Suitable manpower
   B. mathematical techniques, models, and tools
   C. Financial operations

4. Operations research is based upon collected information, knowledge and advanced study of various factors impacting a particular operation. This leads to more informed ------------------------------------.
   A. Management processes
   B. Decision making
   C. Procedures

5. OR can evaluate only the effects of ---.
   A. Personnel factors.
   B. Financial factors
   C. Numeric and quantifiable factors.

True-False

6. By constructing models, the problems in libraries increase and cannot be solved.
   A. True
   B. False
7. Operations Research started just before World War II in Britain with the establishment of teams of scientists to study the strategic and tactical problems involved in military operations.
   A. True

B. False

8. OR can be applied only to those aspects of libraries where mathematical models can be prepared.
   A. True
   B. False
9. The main limitation of operations research is that it often ignores the human element in the production process.
   A. True
   B. False

10. 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

11. The objective function and constraints are functions of two types of variables, ________________ variables and _____________ variables.
    A. Positive and negative
    B. Controllable and uncontrollable
    C. Strong and weak
    D. None of the above

12. 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

13. Who defined OR as scientific method of providing executive departments with a quantitative basis for decisions regarding the operations under their control?
    A. Morse and Kimball (1946)
    B. P.M.S. Blackett (1948)
    C. E.L. Arnoff and M.J. Netzorg
    D. None of the above

14. OR has a characteristics that it is done by a team of
    A. Scientists
    B. Mathematicians
    C. Academics
    D. All of the above

15. Hungarian Method is used to solve
    A. A transportation problem
    B. A travelling salesman problem
    C. A LP problem
    D. Both a & b

16. A solution can be extracted from a model either by
    A. Conducting experiments on it
    B. Mathematical analysis
    C. Both A and B
    D. Diversified Techniques

17. OR uses models to help the management to determine its ______________
    A. Policies
    B. Actions
    C. Both A and B
    D. None of the above

18. What have been constructed from OR problems an methods for solving the models that are available in many cases?
    A. Scientific Models
    B. Algorithms
    C. Mathematical Models
    D. None of the above

19. 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

20. What enables us to determine the earliest and latest times for each of the events and activities and thereby helps in the identification of the critical path?
    A. Programme Evaluation
    B. Review Technique (PERT)
    C. Both A and B
    D. Deployment of resources

21. OR techniques help the directing authority in optimum allocation of various limited resources like______________
    A. Men and Machine
    B. Money

C. Material and Time
D. All of the above

22. 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

UNIT II
LINEAR PROGRAMMING PROBLEMS

23. What is the objective function in linear programming problems?
A. A constraint for available resource
B. An objective for research and development of a company
C. A linear function in an optimization problem
D. A set of non-negativity conditions

24. Which statement characterizes standard form of a linear programming problem?
A. Constraints are given by inequalities of any type
B. Constraints are given by a set of linear equations
C. Constraints are given only by inequalities of >= type
D. Constraints are given only by inequalities of <= type

25. Feasible solution satisfies ___________
A. Only constraints
B. only non-negative restriction
C. [a] and [b] both
D. [a],[b] and Optimum solution

26. In Degenerate solution value of objective function ______________.
A. increases infinitely
B. basic variables are nonzero
C. decreases infinitely
D. One or more basic variables are zero

27. Minimize Z = _______________
A. –maximize(Z)
B. -maximize(-Z)
C. maximize(-Z)
D. none of the above

28. In graphical method the restriction on number of constraint is __________.
    A. 2
    B. not more than 3
    C. 3
    D. none of the above

29. In graphical representation the bounded region is known as _________ region.
    A. Solution
    B. basic solution
    C. feasible solution
    D. optimal

30. Graphical optimal value for Z can be obtained from
    A. Corner points of feasible region
    B. Both a and c
    C. corner points of the solution region
    D. none of the above

31. In LPP the condition to be satisfied is
    A. Constraints have to be linear
    B. Objective function has to be linear
    C. none of the above
    D. both a and b

State True or False:

32. Objective function in Linear Programming problems has always finite value at the optimal solution-TRUE
33. A finite optimal solution can be not unique- FALSE
34. Feasible regions are classified into bounded, unbounded, empty and multiple: TRUE
35. Corner points of a feasible region are located at the intersections of the region and coordinate axes: TRUE

36. Identify the type of the feasible region given by the set of inequalities

x - y <= 1

x - y >= 2

where both x and y are positive.
    A. A triangle
    B. A rectangle
    C. An unbounded region
    D. An empty region

37. Consider the given vectors: a(2,0), b(0,2), c(1,1), and d(0,3). Which of the following vectors are linearly independent?

A. a, b, and c are independent
B. a, b, and d are independent
C. a and c are independent
D. b and d are independent

38. Consider the linear equation
2 x1 + 3 x2 - 4 x3 + 5 x4 = 10
How many basic and non-basic variables are defined by this equation?
A. One variable is basic, three variables are non-basic
B. Two variables are basic, two variables are non-basic
C. Three variables are basic, one variable is non-basic
D. All four variables are basic

39. The objective function for a minimization problem is given by
z = 2 x1 - 5 x2 + 3 x3
The hyperplane for the objective function cuts a bounded feasible region in the space (x1,x2,x3). 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)

40. The feasible region of a linear programming problem has four extreme points: A(0,0), B(1,1), C(0,1), and D(1,0). Identify an optimal solution for minimization problem with the objective function z = 2 x - 2 y
A. A unique solution at C
B. A unique solutions at D
C. An alternative solution at a line segment between A and B
D. An unbounded solution

41. Degeneracy occurs when
A. Basic variables are positive but some of non-basic variables have negative values
B. The basic matrix is singular, it has no inverse
C. Some of basic variables have zero values
D. Some of non-basic variables have zero values

42. Linear programming is a
(a) Constrained optimization technique
(b) Technique for economic allocation of limited resources.
(c) Mathematical techniques
(d) All of the above

43. Constraints in an LP model represents

(a) Limitation
(b) Requirements
(c) Balancing limitations and requirements
(d) All of the above

44. The distinguished feature of an LP model is
(a) Relationship among all variable is linear
(b) It has single objective function and constraints
(c) Value of decision variables is non-negative
(d) All of the above

45. Alternative solution exist of an LP model when
(a) One of the constraints is redundant
(b) Objective function equation is parallel to one of the
(c) Two constrains are parallel
(d) All of the above

46. In the optimal simplex table,
Cj -Zj value indicates
(a) Unbounded solution
(b) Cycling
(c) Alternative solution
(d) None of these

47. For a maximization problem, objective function coefficient for an artificial variable is
(a) + M
(b) -M
(c) Zero
(d) None of these

48. If an optimal solution is degenerate, then
(a) There are alternative optimal solution
(b) The solution is infeasible
(c) The solution is use to the decis ion maker
(d) None of these

49. If a primal LP problem has finite solution, then the dual LP problem should have
(a) Finite solution
(b) Infeasible solution
(c) Unbounded solution
(d) None of these

50. The degeneracy in the transportation problem indicates that

(a) Dummy allocation needs to be added
(b) The problem has no feasible solution
(c) The multiple optimal solution exists.
(d) (a) and (b) only

51. When the total supply is not equal to total demand in a transportation problem then it is called
(a) Balanced
(b) Unbalanced
(e) Degenerate
(d) None of these

52. The solution to a transportation problem with m-rows and n-columns is feasible if number of positive allocations are
(a) m + n
(b) m *n
(c) m+n-l
(d) m+n+l

GAME THEORY

53. A firm that considers the potential reactions of its competitors when it makes a decision
A. is referred to as a price leader.
B. is engaged in strategic behaviour.
C. is engaged in collusion.
D. is referred to as a barometric firm.

54. Which of the following is an example of strategic behaviour?
A. A firm builds excess capacity to discourage the entry of competitors.
B. A firm adopts the pricing behaviour of a dominant firm under the assumption that other firms will do likewise.
C. Firms in an industry increase advertising expenditures to avoid losing market share.
D. All of the above are examples of strategic behaviour.

55. Which one of the following is a part of every game theory model?
A. Players
B. Payoffs
C. Probabilities
D. Strategies

56. In game theory, a choice that is optimal for a firm no matter what its competitors do is referred to as
A. the dominant strategy.

B. the game-winning choice.
C. super optimal.
D. a gonzo selection.

57. Which of the following circumstances in an industry will result in a Nash equilibrium?
A. All firms have a dominant strategy and each firm chooses its dominant strategy.
B. All firms have a dominant strategy, but only some choose to follow it.
C. All firms have a dominant strategy, and none choose it.
D. None of the above is correct.

58. Which of the following describes a Nash equilibrium?
A. A firm chooses its dominant strategy, if one exists.
B. Every competing firm in an industry chooses a strategy that is optimal given the choices of every other firm.
C. Market price results in neither a surplus nor a shortage.
D. All firms in an industry are earning zero economic profits.

59. A prisoners' dilemma is a game with all of the following characteristics except one. Which one is present in a prisoners' dilemma?
A. Players cooperate in arriving at their strategies.
B. Both players have a dominant strategy.
C. Both players would be better off if neither chose their dominant strategy.
D. The payoff from a strategy depends on the choice made by the other player.

60. Which of the following legal restrictions, if enforced effectively, would be likely to solve a prisoners' dilemma type of problem for the firms involved?
A. A law that prevents a cartel from enforcing rules against cheating.
B. A law that makes it illegal for oligopolists to engage in collusion.
C. A law that prohibits firms in an industry from advertising their services.
D. All of the above would be likely to solve a prisoners' dilemma for the firms.

61. Until recently, medical doctors and lawyers have been prohibited from engaging in competitive advertising. If the prisoners' dilemma applies to this situation, then the presence of this restriction would be likely to
A. increase profits earned by individuals in these professions.
B. reduce profits earned by individuals in these professions.
C. have no effect on the profits earned by individuals in these professions.
D. increase the profits of some and reduce the profits of other individuals in these professions.

62. Which one of the following conditions is required for the success of a tit-for-tat strategy?
A. Demand and cost conditions must change frequently and unpredictably.
B. The number of oligopolists in the industry must be relatively small.

C. The game can be repeated only a small number of times.
D. Firms must be unable to detect the behavior of their competitors.

63. A firm may decide to increase its scale so that it has excess production capacity because, by doing so, it is able to
A. minimize its average cost of production.
B. establish a credible deterrent to the entry of competing firms.
C. take advantage of a dominant strategy in a prisoners' dilemma.
D. attain a Nash equilibrium and avoid repeated games.

64. Game theory is concerned with
A. predicting the results of bets placed on games like roulette.
B. the choice of an optimal strategy in conflict situations.
C. utility maximization by firms in perfectly competitive markets.
D. the migration patterns of caribou in Alaska.

65. Which of the following is an example of a game theory strategy?
A. You scratch my back and I'll scratch yours.
B. If the shoe fits, wear it.
C. Monkey see, monkey do.
D. None of the above.

66. In game theory, a situation in which one firm can gain only what another firm loses is called a
A. nonzero-sum game.
B. prisoners' dilemma.
C. zero-sum game.
D. cartel temptation.

67. Which of the following is a nonzero-sum game?
A. Prisoners' dilemma
B. Chess
C. Competition among duopolists when market share is the payoff
D. All of the above.

68. A plan of action that considers the reactions of rivals is an example of
A. accounting liability.
B. strategic behaviour.
C. accommodating behaviour.
D. risk management.

69. In game theory, the outcome or consequence of a strategy is referred to as the
A. payoff.

B. penalty.
C. reward.
D. end-game strategy.

70. A strategy that is best regardless of what rival players do is called
A. first-mover advantage.
B. a Nash equilibrium strategy.
C. tit-for-tat.
D. a dominant strategy.

71. A game that involves interrelated decisions that are made over time is a
A. sequential game.
B. repeated game.
C. zero-sum game.
D. nonzero-sum game.

72. A game that involves multiple moves in a series of identical situations is called a
A. sequential game.
B. repeated game.
C. zero-sum game.
D. nonzero-sum game.

73. Sequential games can be solved using
A. tit-for-tat.
B. dominated strategies.
C. backward induction.
D. risk averaging.

74. A firm that is threatened by the potential entry of competitors into a market builds excess production capacity. This is an example of
A. a prisoners' dilemma.
B. collusion.
C. a credible threat.
D. tit-for-tat.

75. What is the fundamental purpose of game theory?
A. To analyse decision-making
B. To analyse strategic interactions
C. To predict decision outcomes
D. To predict firm behaviour

UNIT III

ASSIGNMENT PROBLEM

76. An assignment problem is considered as a particular case of a transportation problem because
   A. The number of rows equals columns
   B. All xij= 0 or 1
   C. All rim conditions are 1
   D. All of the above

77. An optimal assignment requires that the maximum number of lines that can be drawn through squares with zero opportunity cost be equal to the number of
   A. Rows or columns
   B. Rows & columns
   C. Rows + columns –1 d.
   D. None of the above

78. While solving an assignment problem, an activity is assigned to a resource through a square with zero opportunity cost because the objective is to
   A. Minimize total cost of assignment
   B. Reduce the cost of assignment to zero
   C. Reduce the cost of that particular assignment to zero
   D. All of the above

79. The method used for solving an assignment problem is called
   A. Reduced matrix method
   B. MODI method
   C. Hungarian method
   D. None of the above

80. The purpose of a dummy row or column in an assignment problem is to
   A. Obtain balance between total activities &total resources
   B. Prevent a solution from becoming degenerate
   C. Provide a means of representing a dummy problem
   D. None of the above

81. Maximization assignment problem is transformed into a minimization problem by
   A. Adding each entry in a column from the maximization 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. Any one of the above

82. If there were n workers & n jobs there would be

A. n! solutions
B. (n-1)! solutions
C. (n!)nsolutions
D. n solutions

83. An assignment problem can be solved by
A. Simplex method
B. Transportation method
C. Both a & b
D. None of the above

84. For a salesman who has to visit n cities which of the following are the ways of his tour plan
A. n!
B. (n+1)!
C. (n-1)!
D. n

85. The assignment problem
A. Requires that only one activity be assigned to each resource
B. Is a special case of transportation problem
C. Can be used to maximize resources
D. All of the above

86. An assignment problem is a special case of transportation problem, where
A. Number of rows equals number of columns
B. All rim conditions are 1
C. Values of each decision variable is either 0 or 1
D. All of the above

87. Every basic feasible solution of a general assignment problem, having a square pay-off matrix of order, n should have assignments equal t
A. 2n+1
B. 2n-1
C. m+n-1
D. m+n

88. To proceed with the MODI algorithm for solving an assignment problem, the number of dummy allocations need to be added are
A. n
B. 2n
C. n-1
D. 2n-1

89. The Hungarian method for solving an assignment problem can also be used to solve
    A. A transportation problem
    B. A travelling salesman problem
    C. A LP problem
    D. Both a & b

90. An optimal solution of an assignment problem can be obtained only if
    A. Each row & column has only one zero element
    B. Each row & column has at least one zero element
    C. The data is arrangement in a square matrix
    D. None of the above

91. Which method usually gives a very good solution to the assignment problem?
    A. northwest corner rule
    B. Vogel's approximation method
    C. MODI method
    D. stepping-stone method

92. In applying Vogel's approximation method to a profit maximization problem, row and column penalties are determined by:
    A. finding the largest unit cost in each row or column.
    B. finding the smallest unit cost in each row or column.
    C. finding the sum of the unit costs in each row or column.
    D. finding the difference between the two lowest unit costs in each row and column.
    E. finding the difference between the two highest unit costs in each row and column.

93. The northwest corner rule requires that we start allocating units to shipping routes in the: middle cell.
    A. Lower right corner of the table.
    B. Upper right corner of the table.
    C. Highest costly cell of the table.
    D. Upper left-hand corner of the table.

.

94. The table represents a solution that is:

To=>	1	2	3	Supply
From A	3	6 40	4	40
B	3	4 30	5	30
C	5 20	7	6 10	30

A. an initial solution.
B. Infeasible.
C. degenerate.
D. all of the above
E. none of the above

95. Which of the following is used to come up with a solution to the assignment problem?
A. MODI method
B. northwest corner method
C. stepping-stone method
D. Hungarian method
E. none of the above

96. What is wrong with the following table?

	To==>	1	2	3	Dummy	Supply
From	A	10	8 80	12	0 20	100
	B	6 120	7 40	4 30	0	150
	C	10	9 10	6 170	0 80	250
	Demand	120	80	200	100	

A. **The solution is infeasible**.
B. The solution is degenerate.
C. The solution is unbounded.
D. Nothing is wrong.
E. The solution is inefficient in that it is possible to use fewer routes.

97. The solution presented in the following table is

Table 10-4						
	To==>	1	2	3	Dummy	Supply
From	A	10	8 80	12	0 20	100
	B	6 120	7	4 30	0	150
	C	10	9	6 170	0 80	250
	Demand	120	80	200	100	

A. infeasible.
B. degenerate.
C. unbounded.
D. Optimal.
E. none of the above

98. The solution shown was obtained by Vogel's approximation. The difference between the objective function for this solution and that for the optimal is

	To==>	1	2	3	Dummy	Supply
From	A	10	8	12	0 100	100
	B	6 120	7	4 30	0	150
	C	10	9 80	6 170	0	250
	Demand	120	80	200	100	

A. 40
B. 60
C. 80
D. 100
E. none of the above

99. Optimal solution of an assignment problem can be obtained only if
A. Each row & column has only one zero element
B. Each row & column has at least one zero element
C. The data is arrangement in a square matrix
D. None of the above

100. In assignment problem of maximization, the objective is to maximise
A. Profit
B. optimization
C. cost
D. None of the above

UNIT IV
TRANSPORTATION PROBLEMS

101. What is the difference between minimal cost network flows and transportation problems?

A. The minimal cost network flows are special cases of transportation problems
B. The transportation problems are special cases of the minimal cost network flows
C. There is no difference
D. The transportation problems are formulated in terms of tableaus, while the minimal cost network flows are formulated in terms of graphs

102. With the transportation technique, the initial solution can be generated in any fashion one chooses. The only restriction is that
A. the edge constraints for supply and demand are satisfied.
B. the solution is not degenerate.
C. the solution must be optimal.
D. one must use the northwest-corner method.

103. The purpose of the stepping-stone method is to
A. develop the initial solution to the transportation problem.
B. assist one in moving from an initial feasible solution to the optimal solution.
C. determine whether a given solution is feasible or not.
D. identify the relevant costs in a transportation problem.

104. The purpose of a 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.

105. Which of the following is NOT needed to use the transportation model?

A. the cost of shipping one unit from each origin to each destination
B. the destination points and the demand per period at each
C. the origin points and the capacity or supply per period at each
D. degeneracy

106. 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

107. The transportation method assumes that
A. there are no economies of scale if large quantities are shipped from one source to one destination.

B. 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.
C. there is only one optimal solution for each problem.
D. the number of dummy sources equals the number of dummy destinations.

108. An initial transportation solution appears in the table.

	C	D	Factory Capacity
A	10	0	10
B	15	25	40
Warehouse Demand	25	25	50

Can this solution be improved if it costs $5 per unit to ship from A to C; $7 per unit to ship from A to D; $8 to ship from B to C; and $9 to ship from B to D?

A. Yes, this solution can be improved by $50.
B. Yes, this solution can be improved by $100.
C. **No, this solution is optimal**.
D. Yes, the initial solution can be improved by $10.

109. What is the cost of the transportation solution shown in the table?

	W	X	Y	Supply
A	$3 20	$5 50	$9 0	70
B	$5 0	$4 30	$7 0	30
C	$10 40	$8 0	$3 80	120
Demand	60	80	80	220

A. $1350
B. $1070
C. $1150
D. $1230

110. Which statement regarding this transportation table is best?

	W	X	Y	Supply
A	$3 20	$5 50	$9 0	70
B	$5 0	$4 30	$7 0	30

C	\$10 40	\$8 0	\$3 80	120
Demand	60	80	80	220

A. The solution is degenerate.
B. This solution can be improved by shipping from C to X.
C. This solution would be improved by shipping from B to W.
D. This solution was developed using the northwest corner rule.

111. Which of these statements about the stepping-stone method is best?

A. A dummy source and destination must be added if the number of rows plus columns minus 1 is not equal to the number of filled squares.
B. Only squares containing assigned shipments can be used to trace a path back to an empty square.
C. An improvement index that is a net positive means that the initial solution can be improved.
D. Only empty squares can be used to trace a path back to a square containing an assigned shipment

112. In a transportation problem, we must make the number of ___________ and ___________ equal.
A. destinations; sources
B. units supplied; units demanded
C. columns; rows
D. positive cost coefficients; negative cost coefficients
E. warehouses; suppliers

113. ___________ or ___________ are used to "balance" an assignment or transportation problem.

A. Destinations; sources
B. Units supplied; units demanded
C. Dummy rows; dummy columns
D. Large cost coefficients; small cost coefficients
E. Artificial cells; degenerate cells

114. The net cost of shipping one unit on a route not used in the current transportation problem solution is called the ___________.
A. change index
B. new index
C. MODI index
D. idle index
E. Improvement index

115. The procedure used to solve assignment problems wherein one reduces the original assignment costs to a table of opportunity costs is called __________.
A. stepping-stone method
B. matrix reduction
C. MODI method
D. northwest reduction
E. simplex reduction

116. The method of finding an initial solution based upon opportunity costs is called __________.
A. the northwest corner rule
B. Vogel's approximation
C. Johanson's theorem
D. Flood's technique
E. Hungarian method

117. An assignment problem can be viewed as a special case of transportation problem in which the capacity from each source is _______ and the demand at each destination is ________.
A. 1; 1
B. Infinity; infinity
C. 0; 0
D. 1000; 1000
E. -1; -1

118. _______ occurs when the number of occupied squares is less than the number of rows plus
A. Degeneracy
B. Infeasibility
C. Unboundedness
D. Unbalance
E. Redundancy

119. Both transportation and assignment problems are members of a category of LP problems called ______.
A. shipping problems
B. logistics problems
C. generalized flow problems
D. routing problems
E. network flow problems

120. The equation Ri + Kj = Cij is used to calculate __________.

A. an improvement index for the stepping-stone method
B. the opportunity costs for using a particular route
C. the MODI cost values (Ri, Kj)
D. the degeneracy index
E. optimality test

121. In case of an unbalanced problem, shipping cost coefficients of ______ are assigned to each created dummy factory or warehouse.
A. very high positive costs
B. very high negative costs
C. 10
D. zero
E. one

122. 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

123. The dummy source or destination in a transportation problem is added to
A. Satisfy rim conditions
B. Prevent solution from becoming degenerate
C. Ensure that total cost does not exceed a limit
D. None of the above

124. 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

125. An alternative optimal solution to a minimization transportation problem exists whenever opportunity cost corresponding to unused route of transportation is:
A. Positive & greater than zero
B. Positive with at least one equal to zero
C. Negative with at least one equal to zero
D. None of the above

126. 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

127. The solution to a transportation problem with 'm' rows (supplies) & '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

128. 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

129. 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

130. 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

131. 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

132. When total supply is equal to total demand in a transportation problem, the problem is said to be
A. Balanced

B. Unbalanced
C. Degenerate
D. None of the above

133. 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

134. The degeneracy in the transportation problem indicates that
A. Dummy allocation(s) needs to be added
B. The problem has no feasible solution
C. The multiple optimal solution exist
D. a & b but not c

135. 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:
A. Unbalanced.
B. Infeasible.
C. Optimal.
D. impossible.
E. Degenerate.

136. The only restriction we place on the initial solution of a transportation problem is that: we must have nonzero quantities in a majority of the boxes.
A. all constraints must be satisfied.
B. demand must equal supply.
C. we must have a number (equal to the number of rows plus the number of columns minus one) of boxes which contain nonzero quantities.
D. None of the above

137. 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 condition are satisfied
C. the solution not be degenerate
D. all of the above

138. The dummy source or destination in a transportation problem is added to
A. satisfy rim condition
B. prevent solution from becoming degenerate

C. ensure that total cost does not exceed a limit
D. all of the above

139. 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

140. An alternative optimal solution to a minimization transportation problem exists whenever opportunity cost corresponding to unused routes of transportation is:
A. positive and greater than zero
B. positive with at least one equal to zero
C. negative with at least one equal to zero
D. all of the above

141. 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 degenerate initial solution
D. all of the above