UNIVERSITY OF CALICUT

SCHOOL OF DISTANCE EDUCATION

BSc(MATHEMATICS)-VI SEMESTER-QUESTION BANK

MAT6B13[E02]-LINEAR PROGRAMMING

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1. In a Linear Programming Problem, the constraints are
   (a) linear
   (b) quadratic
   (c) cubic
   (d) constants
   Answer : (**a**)

2. A subset $S \subset \mathbf{R^n}$ is said to be convex, if for each pair of points $\mathbf{x}$, $\mathbf{y}$ in $\mathbf{S}$,
   (a) $S \subset [\mathbf{x} : \mathbf{y}]$
   (b) the line segment $[\mathbf{x} : \mathbf{y}] \subset \mathbf{S}$
   (c) $\mathbf{x} - \mathbf{y} \in \mathbf{S}$
   (d) $\mathbf{xy} \in \mathbf{S}$
   Answer : (**b**)

3. For any two points $\mathbf{x}$ and $\mathbf{y}$ in $\mathbf{R^n}$, the set $\{u : u = \lambda\mathbf{x} + (1-\lambda)\mathbf{y}, 0 \leq \lambda \leq 1\}$ is called
   (a) the circle
   (b) a parabola
   (c) an ellipse
   (d) the line segment joining the points x and y
   Answer : (**d**)

4. For any two points $\mathbf{x}$ and $\mathbf{y}$ in $\mathbf{R^n}$, the line segment $[\mathbf{x} : \mathbf{y}]$ is
   (a) convex
   (b) not convex
   (c) a loop
   (d) a half space
   Answer : (**a**)

5. In $\mathbf{R^3}$ the closed ball $\mathbf{x_1^2} + \mathbf{x_2^2} + \mathbf{x_3^2} \leq \mathbf{1}$ is
   (a) not convex
   (b) convex
   (c) a loop
   (d) a half space
   Answer : (**b**)

6. The intersection of a finite number of convex sets is
   (a) not convex
   (b) a half space
   (c) a cone
   (d) convex
   Answer : (**d**)

7. A nonempty subset $\mathbf{C} \subset \mathbf{R^n}$ is said to be a CONE if for each $\mathbf{x} \in \mathbf{C}$ and $\lambda \geq 0$,
   (a) the vector $\lambda\mathbf{x^2} \in \mathbf{C}$
   (b) the vector $\lambda\mathbf{x} \notin \mathbf{C}$
   (c) the vector $\lambda\mathbf{x} \in \mathbf{C}$
   (d) the vector $\lambda\mathbf{x} \in \mathbf{R^n}$
   Answer : (**c**)

8. The sets $H_1 = \{\mathbf{x}|\mathbf{c}.\mathbf{x} \geq \mathrm{z}\}$ and $H_2 = \{\mathbf{x}|\mathbf{c}.\mathbf{x} \leq \mathrm{z}\}$ are called
   (a) hyper planes
   (b) circles

(c) line segments
(d) closed half spaces
Answer : (**d**)

9. The closed half spaces are
(a) not convex
(b) hyper planes
(c) convex
(d) a cone
Answer : (**c**)

10. The intersection of a finite number of closed half spaces in $\mathbf{R^n}$ is called
(a) a polyhedral convex set
(b) a half space
(c) a cone
(d) a convex set
Answer : (**a**)

11. If $A \subset \mathbf{R^n}$, then the convex hull of A is the
(a) convex set containing A
(b) intersection of all convex sets containing A
(c) union of all convex sets containing A
(d) subset of a convex set containing A
Answer : (**b**)

12. Union of convex sets is
(a) convex
(b) not convex
(c) need not be convex
(d) a cone
Answer : (**c**)

13. The set of all convex combinations of a finite number of vectors $\mathbf{x_1}, \mathbf{x_2}, ..., \mathbf{x_k}$ in $\mathbf{R^n}$ is
(a) not a convex set
(b) a hyper plane
(c) a cone
(d) a convex set
Answer : (**d**)

14. Let $\mathbf{x_1}, \mathbf{x_2}, ..., \mathbf{x_k}$ be a finite number of vectors in $\mathbf{R^n}$. Then the set of all convex combinations of the given vectors is called a
(a) polytope
(b) cone
(c) hyper plane
(d) convex set
Answer : (**a**)

15. A convex polyhedron having exactly $(n + 1)$ vertices is
(a) not a convex set
(b) a hyperplane
(c) a cone
(d) a simplex in n dimension
Answer : (**d**)

16. An ϵ-nbd of $x_0 \in \mathbf{R^1}$ is
(a) $\{x_0\}$
(b) $(x_0 - \epsilon, x_0 + \epsilon)$
(c) $(x_0 + \epsilon, x_0 - \epsilon)$
(d) $(-\epsilon, \epsilon)$
Answer : (**b**)

17. A set that contains the ϵ-nbd of each of its points, is called
(a) the boundary of the set
(b) the closure of the set
(c) an open set
(d) a closed set
Answer : (**c**)

18. A set is said to be closed if its,
(a) complement is open
(b) complement is not open
(c) complement is convex
(d) complement is not convex
Answer : (**a**)

19. $Int\ [0,1] = ---$
(a) $(0 - \epsilon, 1 - \epsilon)$
(b) $[0,1]$
(c) $(1,2)$
(d) $(0,1)$
Answer : (**d**)

20. Let S be a convex subset of the plane, bounded by lines in the plane. Then a linear function $z = c_1x_1 + c_2x_2$, where $x_1, x_2 \in S$, c_1 *and* c_2 are scalars, attains its extreme values at
(a) the interior of S
(b) the vertices of S
(c) the exterior of S
(d) the X-axis
Answer : (**b**)

21. The solution of $Maximize\ z = 2x_1 + 3x_2$
subject to the constraints:
$x_1 + 2x_2 \leq 10$
$x_1 + x_2 \leq 6$
$x_1 \leq 4$
$x_1, x_2 \geq 0$ is
(a) 2,4
(b) 2,3
(c) 2,5
(d) 2,9
Answer : (**a**)

22. $\partial\ (0,1) = ---$
(a) $\{0\}$
(b) $\{0,1\}$

(c) $\{1\}$
(d) $\{0, 2\}$
Answer : (**b**)

23. In a General Linear Programming Problem, the objective function is
(a) cubic
(b) quadratic
(c) linear
(d) constant
Answer : (**c**)

24. If the constraints of a General Linear Programming Problem is $\sum_{j=1}^{n} a_{ij}x_j \leq b_i$,$i = 1, 2, ..., k$, then the slack variables x_{n+i} satisfy
(a) $\sum_{j=1}^{n} a_{ij}x_j + x_{n+i} = b_i$,$i = 1, 2, ..., k$
(b) $\sum_{j=1}^{n} a_{ij}x_j + x_{n+i} \neq b_i$,$i = 1, 2, ..., k$
(c) $\sum_{j\leq 1}^{n} a_{ij}x_j + x_{n+i} \leq b_i$,$i = 1, 2, ..., k$
(d) $\sum_{j=1}^{n} a_{ij}x_j + x_{n+i} \geq b_i$,$i = 1, 2, ..., k$
Answer : (**a**)

25. If the constraints of a General Linear Programming Problem is $\sum_{j=1}^{n} a_{ij}x_j \geq b_i$,$i = 1, 2, ..., k$, then the surplus variables x_{n+i} satisfy
(a) $\sum_{j=1}^{n} a_{ij}x_j + x_{n+i} = b_i$,$i = 1, 2, ..., k$
(b) $\sum_{j=1}^{n} a_{ij}x_j - x_{n+i} \neq b_i$,$i = 1, 2, ..., k$
(c) $\sum_{j\leq 1}^{n} a_{ij}x_j - x_{n+i} \leq b_i$,$i = 1, 2, ..., k$
(d) $\sum_{j=1}^{n} a_{ij}x_j - x_{n+i} = b_i$,$i = 1, 2, ..., k$
Answer : (**d**)

26. A feasible solution to the General Linear Programming Problem is
(a) any solution to a General L.P.P.
(b) a particular solution to a General L.P.P.
(c) any solution to a General L.P.P. which satisfies the non-negative restrictions
(d) a particular solution to a General L.P.P. which satisfies the non-negative restrictions
Answer : (**c**)

27. An optimum solution to the General Linear Programming Problem is
(a) any feasible solution to a General L.P.P.
(b) any feasible solution which optimizes the objective function
(c) any solution to a General L.P.P. which satisfies the non-negative restrictions
(d) a particular solution to a General L.P.P. which satisfies the non-negative restrictions
Answer : (**b**)

28. The $standard\ form$ of L.P.P. is
(a) Maximize $z = \mathbf{c^T x}$ subject to constraints: $\mathbf{Ax} \geq \mathbf{b}$, $\mathbf{x} \geq 0$
(b) Maximize $z = \mathbf{c^T x}$ subject to constraints: $\mathbf{Ax} \leq \mathbf{b}$, $\mathbf{x} \geq 0$
(c) Minimize $z = \mathbf{c^T x}$ subject to constraints: $\mathbf{Ax} = \mathbf{b}$, $\mathbf{x} \geq 0$
(d) Maximize $z = \mathbf{c^T x}$ subject to constraints: $\mathbf{Ax} = \mathbf{b}$, $\mathbf{x} \geq 0$
Answer : (**d**)

29. The $canonical\ form$ of L.P.P. is
(a) Maximize $z = \mathbf{c^T x}$ subject to constraints: $\mathbf{Ax} \geq \mathbf{b}$, $\mathbf{x} \geq 0$
(b) Maximize $z = \mathbf{c^T x}$ subject to constraints: $\mathbf{Ax} \leq \mathbf{b}$, $\mathbf{x} \geq 0$
(c) Minimize $z = \mathbf{c^T x}$ subject to constraints: $\mathbf{Ax} = \mathbf{b}$, $\mathbf{x} \geq 0$
(d) Maximize $z = \mathbf{c^T x}$ subject to constraints: $\mathbf{Ax} = \mathbf{b}$, $\mathbf{x} \geq 0$
Answer : (**b**)

30. In the iteration of simplex method, if $z_j - c_j \geq 0$ for all j, then the initial basic feasible solution is
(a) not a solution
(b) not optimal
(c) an optimum solution
(d) none of the above
Answer : (**c**)

31. A degenerate solution to the system $\mathbf{Ax} = \mathbf{b}$ is
(a) a basic solution with one or more basic variables vanish
(b) a solution with one or more basic variables vanish
(c) a particular solution with one or more basic variables vanish
(d) a basic solution with no basic variable vanish
Answer : (**a**)

32. A feasible solution to an L.P.P. which is also a basic solution to the problem is called
(a) an optimum solution to the L.P.P.
(b) a standard solution to the L.P.P.
(c) a basic feasible solution to the L.P.P.
(d) a feasible solution to the L.P.P.
Answer : (**c**)

33. Let $\mathbf{x_B}$ and $\mathbf{x_B^*}$ be two basic feasible solutions to the standard L.P.P., then $\mathbf{x_B^*}$ is said to be an improved basic feasible solution as compared to $\mathbf{x_B}$, if
(a) $\mathbf{c_B^{T^*}}.\mathbf{x_B^*} \leq \mathbf{c_B^T}.\mathbf{x_B}$, where $\mathbf{c_B^*}$ is constituted of cost components corresponding to $\mathbf{x_B^*}$
(b) $\mathbf{c_B^{T^*}}.\mathbf{x_B^*} \neq \mathbf{c_B^T}.\mathbf{x_B}$, where $\mathbf{c_B^*}$ is constituted of cost components corresponding to $\mathbf{x_B^*}$
(c) $\mathbf{c_B^{T^*}}.\mathbf{x_B^*} = \mathbf{c_B^T}.\mathbf{x_B}$, where $\mathbf{c_B^*}$ is constituted of cost components corresponding to $\mathbf{x_B^*}$
(d) $\mathbf{c_B^{T^*}}.\mathbf{x_B^*} \geq \mathbf{c_B^T}.\mathbf{x_B}$, where $\mathbf{c_B^*}$ is constituted of cost components corresponding to $\mathbf{x_B^*}$
Answer : (**d**)

34. A basic feasible solution $\mathbf{x_B}$ to the L.P.P., Maximize $z = \mathbf{c^T x}$ subject to constraints: $\mathbf{Ax} = \mathbf{b}$, $\mathbf{x} \geq 0$ is called an optimum basic feasible solution if
(a) $z_0 = \mathbf{c_B^T}.\mathbf{x_B} \geq \mathrm{z}^*$, where z^* is the value of the objective function for any feasible solution
(b) $z_0 = \mathbf{c_B^T}.\mathbf{x_B} \leq \mathrm{z}^*$, where z^* is the value of the objective function for any feasible solution
(c) $z_0 = \mathbf{c_B^T}.\mathbf{x_B} \neq \mathrm{z}^*$, where z^* is the value of the objective function for any feasible solution

(d) $z_0 = \mathbf{c_B^T}.\mathbf{x_B} < z^*$, where z^* is the value of the objective function for any feasible solution
Answer : (**a**)

35. The set of feasible solutions to an L.P.P. is
(a) an open set
(b) not a convex set
(c) a convex set
(d) a cone
Answer : (**c**)

36. A hyperplane in $\mathbf{R^n}$ is
(a) a convex set
(b) not a convex st
(c) a cone
(d) none of the above
Answer : (**a**)

37. The number of extreme points of the convex set of feasible solutions of an L.P.P. is
(a) infinite
(b) finite
(c) 1
(d) 3
Answer : (**b**)

38. L.P.P.s involving artificial variables can be solved by using
(a) simplex algorithm
(b) graph
(c) simplex method
(d) two-phase simplex method
Answer : (**d**)

39. If $A = \{a, b, c\}$, where a, b, c are three points in the plane, then convex hull of A is
(a) a circular disc containing a, b, c
(b) a triangular region whose vertices are a, b, c
(c) a square whose three vertices are a, b, c
(d) none of the above
Answer : (**b**)

40. Big M method is used to solve an L.P.P., if it contains
(a) artificial variables
(b) variables
(c) surplus variables
(d) slack variables
Answer : (**a**)

41. A variable x is called unrestricted if
(a) x is zero only
(b) x is negative only
(c) x is positive, negative or zero
(d) x is positive only
Answer : (**c**)

42. The dual of L.P.P., Maximize $z = \mathbf{c^T x}$ subject to constraints: $\mathbf{Ax} \leq \mathbf{b}$, $\mathbf{x} \geq 0$, $\mathbf{x}, \mathbf{c} \in \mathbf{R^n}$, $\mathbf{b} \in \mathbf{R^m}$, $\mathbf{A}$ is an $m \times n$ matrix, is
(a) Maximize $z^* = \mathbf{b^T w}$ subject to constraints: $\mathbf{A^T w} \geq \mathbf{c}$, $\mathbf{w} \geq 0$, $\mathbf{c} \in \mathbf{R^n}$, $\mathbf{w}, \mathbf{b} \in \mathbf{R^m}$, $\mathbf{A^T}$ is the transpose of an $m \times n$ matrix $\mathbf{A}$
(b) Minimize $z^* = \mathbf{b^T w}$ subject to constraints: $\mathbf{A^T w} \geq \mathbf{c}$, $\mathbf{w} \geq 0$, $\mathbf{c} \in \mathbf{R^n}$, $\mathbf{w}, \mathbf{b} \in \mathbf{R^m}$, $\mathbf{A^T}$ is the transpose of an $m \times n$ matrix $\mathbf{A}$
(c) Minimize $z^* = \mathbf{b^T w}$ subject to constraints: $\mathbf{A^T w} \leq \mathbf{c}$, $\mathbf{w} \geq 0$, $\mathbf{w}, \mathbf{c} \in \mathbf{R^n}$, $\mathbf{b} \in \mathbf{R^m}$, $\mathbf{A^T}$ is the transpose of an $m \times n$ matrix $\mathbf{A}$
(d) Maximize $z^* = \mathbf{b^T w}$ subject to constraints: $\mathbf{A^T w} \leq \mathbf{c}$, $\mathbf{w} \geq 0$, $\mathbf{w}, \mathbf{c} \in \mathbf{R^n}$, $\mathbf{b} \in \mathbf{R^m}$, $\mathbf{A^T}$ is the transpose of an $m \times n$ matrix $\mathbf{A}$
Answer : (**b**)

43. If the number of dual variables are m and primal constraints are n, then
(a) $m \neq n$
(b) $m > n$
(c) $m < n$
(d) $m = n$
Answer : (**d**)

44. If A is the constraint coefficient matrix associated with primal and B is the constraint coefficient matrix associated with dual, then
(a) $B = A^T$
(b) $B = A$
(c) $B = A^{-1}$
(d) $A = B^{-1}$
Answer : (**a**)

45. The objective function in primal problem is
(a) minimization type only
(b) maximization and minimization type
(c) maximization or minimization type
(d) maximization type only
Answer : (**c**)

46. The dual of dual problem is
(a) the unsymmetric dual problem
(b) the unsymmetric primal problem
(c) the dual problem
(d) the primal problem
Answer : (**d**)

47. A transportation problem is
(a) not an L.P.P.
(b) an L.P.P.
(c) a dual problem only
(d) a primal problem only
Answer : (**b**)

48. In a transportation problem, let $a_i > 0, \quad i = 1, 2...., m$ be the availability at the i^{th} origin and $b_j > 0, \quad j = 1, 2...., n$ be the requirement at the j^{th} destination, then the problem is said to be balanced, if
(a) $\sum_{i=1}^{m} a_i \neq \sum_{j=1}^{n} b_j$

(b) $\sum_{i=1}^{m} a_i \leq \sum_{j=1}^{n} b_j$
(c) $\sum_{i=1}^{m} a_i \geq \sum_{j=1}^{n} b_j$
(d) $\sum_{i=1}^{m} a_i = \sum_{j=1}^{n} b_j$
Answer : (**d**)

49. A balanced transportation problem has
(a) an optimal solution always
(b) no solution
(c) no feasible solution
(d) no optimal solution
Answer : (**a**)

50. In a transportation problem, the coefficients of constraints are
(a) 2 only
(b) 1 only
(c) either 0 or 1
(d) 0 only
Answer : (**c**)

51. If there are m origins and n destinations in a transportation problem, then the order of the matrix containing the coefficients of constraints is
(a) $(m + n) \times mn$
(b) $(m - n) \times mn$
(c) $(m + n) \times (m + n)$
(d) $mn \times (m + n)$
Answer : (**a**)

52. A system of n linear equations $\mathbf{Ax} = \mathbf{b}$ is called a triangular system if the matrix $\mathbf{A}$ is
(a) unit matrix
(b) zero matrix
(c) diagonal matrix
(d) triangular matrix
Answer : (**d**)

53. The column coefficients of the dual constraints are
(a) the coefficients of the primal objective function
(b) the column coefficients of the primal constraints
(c) the row coefficients of the primal constraints
(d) none of the above
Answer : (**c**)

54. If the primal is of maximization type, then the dual is
(a) minimization type
(b) maximization type
(c) either maximization or minimization type
(d) none of the above
Answer : (**a**)

55. An initial feasible solution to a T.P. is obtained by
(a) method of penalties

(b) North-west corner rule
(c) two-phase simplex method
(d) big M method
Answer : (**b**)

56. An initial basic feasible solution to a T.P. is obtained by
(a) method of penalties
(b) two-phase simplex method
(c) row minima method
(d) big M method
Answer : (**c**)

57. An initial basic feasible solution to a T.P. is obtained by
(a) method of penalties
(b) column minima method
(c) two-phase simplex method
(d) big M method
Answer : (**b**)

58. In a transportation problem, let $a_i > 0, \quad i = 1, 2...., m$ be the availability at the i^{th} origin and $b_j > 0, \quad j = 1, 2...., n$ be the requirement at the j^{th} destination, then the problem is said to be unbalanced, if
(a) $\sum_{i=1}^{m} a_i \neq \sum_{j=1}^{n} b_j$
(b) $\sum_{i=1}^{m} a_i = \sum_{j=1}^{n} b_j$
(c) $\sum_{i=1}^{m} a_i + \sum_{j=1}^{n} b_j = 1$
(d) $\sum_{i=1}^{m} a_i - \sum_{j=1}^{n} b_j = 1$
Answer : (**a**)

59. An L.P.P. can be solve using graphical method if it has
(a) more than four variables
(b) only two variables
(c) more than two variables
(d) three variables
Answer : (**b**)

60. The assignment problem is a special case of transportation problem because
(a) the number of origins is not equal to number of destinations
(b) the number of origins is greater than number of destinations
(c) the number of origins is less than number of destinations
(d) the number of origins is equal to number of destinations
Answer : (**d**)

61. The assignment problem is solved using
(a) method of penalties
(b) two-phase simplex method
(c) Hungarian method
(d) big M method
Answer : (**c**)

62. Hungarian method for solving assignment problem is
(a) an iterative method
(b) a direct method
(c) a computer program
(d) both direct and iteratve method
Answer : (**a**)

63. An optimal solution of transportation problem is obtained by
(a) north-west corner rule
(b) row minima method
(c) VAM
(d) MODI method
Answer : (**d**)

64. MODI method is
(a) a direct method
(b) an iterative method
(c) a computer program
(d) both direct and iteratve method
Answer : (**b**)

65. The initial basic feasible solution of a transportation problem obtained by north-west corner rule is
(a) an optimum
(b) near to optimum
(c) far from optimum
(d) none of the above
Answer : (**c**)

66. In a transportation problem there is more demand than the availability, then the problem is said to be
(a) unbalanced
(b) balanced
(c) degenerate
(d) non degenerate
Answer : (**a**)

67. In an assignment problem, the number of jobs and number of persons are not equal then the problem is
(a) balanced
(b) unbalanced
(c) degenerate
(d) non degenerate
Answer : (**b**)

68. An unbalanced assignment problem can be solved by
(a) adding dummy rows or columns
(b) adding dummy rows only
(c) adding dummy columns only
(d) none of the above
Answer : (**a**)

69. A General Linear Programming Problem consists of
(a) an objective function
(b) a set of constraints
(c) an objective function and a set of constraints
(d) none of the above
Answer : (**c**)

70. $Cl\ (2,7) = --$
(a) $(2,7)$
(b) $(2,7]$
(c) $[2,7)$
(d) $[2,7]$
Answer : (**d**)

71. A circular disc in a plane is
(a) a convex set
(b) a half space
(c) a hyperplane
(d) not a convex set
Answer : (**a**)

72. If $\mathbf{S}$ and $\mathbf{T}$ are two convex sets in $\mathbf{R^n}$, then $\mathbf{S} + \mathbf{T}$ is
(a) a half space
(b) a convex set
(c) a hyperplane
(d) not a convex set
Answer : (**b**)

73. If $\mathbf{S}$ and $\mathbf{T}$ are two convex sets in $\mathbf{R^n}$, then $\mathbf{S} - \mathbf{T}$ is
(a) a half space
(b) not a convex set
(c) a hyperplane
(d) a convex set
Answer : (**d**)

74. A simplex in zero dimension is
(a) a point
(b) a line
(c) a square
(d) none of the above
Answer : (**a**)

75. A simplex in one dimension is
(a) a point
(b) a line segment
(c) a square
(d) none of the above
Answer : (**b**)

76. A simplex in two dimension is
(a) a point
(b) a line

(c) a triangle
(d) none of the above
Answer : (**c**)

77. A cone is
(a) a convex set always
(b) need not be a convex set
(c) a point
(d) none of the above
Answer : (**b**)

78. A point is called a boundary point of a set S, if every ϵ-*nbd* of that point contains
(a) a point of S and a point not in S
(b) a point of S only
(c) a point, not in S only
(d) a point of S or a point not in S
Answer : (**a**)

79. $Int\ [3,6] = - - -$
(a) $(3-\epsilon, 6-\epsilon)$
(b) $[3,6]$
(c) $(3,6)$
(d) $(2,7)$
Answer : (**c**)

80. $Cl\ (3,6) = - - -$
(a) $(3-\epsilon, 6-\epsilon)$
(b) $(0,1)$
(c) $(3,6)$
(d) $[3,6]$
Answer : (**d**)

81. In graphical method for solving an L.P.P., the solution space is in
(a) first quadrant
(b) second quadrant
(c) third quadrant
(d) fourth quadrant
Answer : (**a**)

82. In graphical method for solving an L.P.P., the solution space is
(a) not a convex set
(b) a convex set
(c) unbounded
(d) none of the above
Answer : (**b**)

83. In a Linear Programming Problem, if the objective function is of minimization type, then it can be converted into maximization type by
(a) multiplying the objective function by 2
(b) multiplying the objective function by 3
(c) multiplying the objective function by -1
(d) multiplying the objective function by -2
Answer : (**c**)

84. In a Linear Programming Problem, all the variables are
(a) non negative
(b) negative
(c) 0
(d) none of the above
Answer : (**a**)

85. The optimal solution to an L.P.P. is
(a) always infinite
(b) always finite
(c) unique
(d) either unique or infinite
Answer : (**d**)

86. Let f be a linear function of n variables, then by Minimax theorem,
(a) $Minimum\ f(\mathbf{x})$ = Maximum{f($\mathbf{x}$)}
(b) $Minimum\ f(\mathbf{x})$ = Maximum{-f($\mathbf{x}$)}
(c) $Minimum\ f(\mathbf{x})$ = -Maximum{-f($\mathbf{x}$)}
(d) $Minimum\ f(\mathbf{x})$ = -Maximum{f($\mathbf{x}$)}
Answer : (**c**)

87. The simplex method is
(a) an iterative method
(b) a direct method
(c) both direct and iteratve method
(d) none of the above
Answer : (**a**)

88. The objective function in dual problem is
(a) maximization type only
(b) maximization or minimization type
(c) minimization type only
(d) none of the above
Answer : (**b**)

89. In a transportation problem the number of origins and destinations are
(a) equal
(b) not equal
(c) need not be equal
(d) none of the above
Answer : (**c**)

90. Loop is associated with
(a) two-phase simplex method
(b) big M method
(c) assignment problem
(d) transportation problem
Answer : (**d**)

91. A feasible solution to a T.P. is basic if and only if the corresponding cells in the transportation table
(a) do not contain a loop

(b) contain a loop
(c) contain zero vectors
(d) none of the above
Answer : (**a**)

92. In north west corner rule, the first assignment is made in the cell occupying,
(a) bottom corner of the transportation table
(b) north-west corner of the transportation table
(c) top-right corner of the transportation table
(d) none of the above
Answer : (**b**)

93. In row minima method, the first assignment is made in the cell with
(a) smallest cost in the second row of the transportation table
(b) smallest cost in the transportation table
(c) largest cost in the first row of the transportation table
(d) smallest cost in the first row of the transportation table
Answer : (**d**)

94. In matrix minima method, the first assignment is made in the cell with
(a) smallest cost in the second row of the transportation table
(b) smallest cost in the first column of the transportation table
(c) smallest cost in the cost matrix of the transportation table
(d) smallest cost in the first row of the transportation table
Answer : (**c**)

95. Vogel's approximation method is connected with
(a) T.P.
(b) assignment problem
(c) both T.P. and assignment problem
(d) none of the above
Answer : (**a**)

96. An unbalanced transportation problem can be solved by
(a) introducing dummy destinations or sources
(b) introducing dummy destinations only
(c) introducing dummy sources only
(d) none of the above
Answer : (**a**)

97. In an assignment problem with cost (c_{ij}), if all the $c_{ij} \geq 0$, then a feasible solution (x_{ij}) is an optimal solution if
(a) $\sum\sum c_{ij}x_{ij} = 1$
(b) $\sum\sum c_{ij}x_{ij} = -1$
(c) $\sum\sum c_{ij}x_{ij} = 2$
(d) $\sum\sum c_{ij}x_{ij} = 0$
Answer : (**d**)

98. The maximum assignment problem can be converted into minimization problem,
(a) by substracting from the lowest element, all the elements of the given cost matrix
(b) by adding from the highest element, all the elements of the given cost matrix
(c) by substracting from the highest element, all the elements of the given cost matrix

(d) none of the above
Answer : (**c**)

99. In the iteration of simplex method, if there are more than one negative $z_j - c_j$, then we may choose
(a) the most negative of them
(b) the largest of them
(c) any one of them
(d) none of the above
Answer : (**a**)

100. An example of an L.P.P. is
(a) assignment problem
(b) transportation problem
(c) both (a) and (b)
(d) none of the above
Answer : (**c**)

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