Select the proper of the question.

1. **Operations research came into existence ....**
   a) During world war I
   b) During World war II
   c) In the year 1950
   d) In the year 1955

2. **The term Operations Research was first coined by.........**
   a) K. Erlang
   b) H. C. Levinson
   c) H. M. Wagner
   d) McClosky and Trefthen

3. **An abbreviation O.R. stands for ....**
   a) Operations Research
   b) Operation Reports
   c) Operating Research
   d) None of the above

4. **A LPP consists of ....**
   a) Decision variables
   b) Objective function
   c) Constraints and non-negativity restrictions
   d) All of the above

5. **The term LPP stands for**
   a) Linear processing problem
   b) Linear programming problem
   c) Logarithmic programming problem
   d) None of the above

6. **Which of the following is correct about LPP?**
   a) Objective function must be linear
   b) All constraints must be linear
   c) Decision variables must be non negative
   d) All of the above

7. **Graphical method is used if there are only .... variables.**
   a) Four
   b) Three
   c) Two
   d) None of the above
8. **The set of feasible solution to LPP is .... set**
   a) Convex
   b) Concave
   c) Both a and b
   d) None of the above
9. **In the standard form of LPP all constraints are of .... type**
   a) Less than or equal to
   b) Greater than or equal to
   c) Equal to
   d) None of the above
10. **If dual has optimal solution then primal has . .. . solution**
    a) Unbounded
    b) Optimal
    c) Infeasible
    d) None of the above

MCQ Transportation Problem:

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

12. A transportation problem is said to be balanced if ....
    e) quantity demanded < quantity supplied
    f) quantity demanded > quantity supplied
    g) quantity demanded ≠ quantity supplied
    h) quantity demanded = quantity supplied

13. The transportation problem is Unbalanced if ....
    i) quantity demanded > quantity supplied
    j) quantity demanded < quantity supplied
    k) quantity demanded ≠ quantity supplied
    l) all of the above

14. The objective of the transportation problem is to .... the total cost.
- m) maximize
- n) minimize
- o) fix
- p) none of the above

15. A transportation problem is a special type of ......
- q) LPP
- r) Assignment
- s) both a and b
- t) neither a and b

16. Which of the following method cannot be used to solve transportation problem?
- u) North-West corner rule
- v) Matrix minima method
- w) Vogel's Approximation method
- x) Graphical method

17. ------------ is a subclass of a linear programming problem (LPP)
- y) Computer problem
- z) Transportation problem
- aa) both a and c
- bb) None

18. Necessary and sufficient condition for existence of a feasible solution to a m x n transportation problem is....
- cc) $\sum_{i=1}^{m} a_i = \sum_{j=1}^{n} b_j$
- dd) $\sum_{i=1}^{m} a_i > \sum_{j=1}^{n} b_j$
- ee) $\sum_{i=1}^{m} a_i < \sum_{j=1}^{n} b_j$
- ff) $\sum_{i=1}^{m} a_i \neq \sum_{j=1}^{n} b_j$

19. In --------------- method consider the least cost and next to least cost for solving transportation problem.
- gg) North-west corner
- hh) Matrix minima
- ii) Vogel's Approximation
- jj) Row Minima method

20. The initial feasible solution of transportation problem obtained by .... method is very closer to optimum solution
- kk) Matrix Minima
- ll) Vogel's Approximation

mm) North-West corner rule

nn) Row Minima

Assignment problem MCQ

21. **An algorithm used for solving an assignment problem is called**
    a) Matrix Minima method
    b) Vogel's Approximation method
    c) Hungarian Algorithm
    d) Simplex method

22. **An assignment problem is a special case of transportation problem in which number of origins is ....**
    a) Equal to the number of destinations
    b) Greater than number of destinations
    c) less than number of destinations
    d) None of the above

23. **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

24. **In making assignment which of the following should be preferred ....**
    a) Only that row which have single zero
    b) Only that column which have single zero
    c) Only that row having more than one zero
    d) Only that column having more than one zero

25. **The term idle time is used in ....**
    a) LPP
    b) Assignment problem
    c) Sequencing Problem
    d) Transportation Problem

26. **In sequencing algorithm....**
    a) The selection of an appropriate order for a series of jobs to be done in a finite service facility
    b) All the jobs must be processed on first come first serve basis
    c) A service facility can process more than one job at a time
    d) All the facilities are not of different type

27. A sequencing problem involving six jobs and three machines requires evaluation of ......
   a) $(6!+6!+6!)$ Sequences
   b) $(6!)^3$ Sequences
   c) $(6 \times 6 \times 6)$ Sequences
   d) $(6 + 6 + 6)$ Sequences

28. Gnatt chart can be used to determine optimum sequence in relatively small sized.........
   a) Assignment problems
   b) LPP
   c) Transportation Problems
   d) Sequencing problems

29. In n job and two machines (say M1 and M2) sequencing problems with order of processing the jobs is M1M2 ....
   a) Job having minimum time on machine M2 is processed in the first
   b) Job having minimum time on machine M2 is processed in the last
   c) Job having minimum time on machine M1 is processed in the last
   d) Job having maximum time on machine M2 is processed in the last

30. The term total elapsed time is used in ......
   a) LPP
   b) Assignment problem
   c) Transportation Problem
   d) Sequencing Problem

ANOVA

31. Analysis of variance is a statistical method of comparing the _____ of several populations.
   a) standard deviations
   b) variances
   c) means
   d) proportions

32. In ANOVA ------ statistic is used to test the hypothesis.
   a) F
   b) t
   c) Z
   d) Chi-Square

33. The term Analysis of variance was first introduced by ....
   a) Cochran W. G.
   b) Cox G. M.
   c) Snedecor G. W.
   d) Fisher R. A.

34. Mean sum of square due to error =
   a) $\dfrac{\text{Sum of Square due to error}}{\text{Error degrees of freedom}}$
   b) (sum of Square due to error)x(Error degrees of freedom)
   c) $\dfrac{\text{Error degrees of freedom}}{\text{Sum of Square due to error}}$
   d) None of the above

35. A linear mathematical model of one way classification is
   a) $y_{ij} = \mu - \alpha_i - e_{ij}$
   b) $y_{ij} = \mu + \alpha_i$
   c) $y_{ij} = \mu + e_{ij}$
   d) $y_{ij} = \mu + \alpha_i + e_{ij}$

36. If there are 4 treatments, then degrees of freedom for treatment sum of square will be equal to ...
   a) 4
   b) 3
   c) 2
   d) 5

37. A linear mathematical model of two way classification with one observation per cell is ..
   a) $y_{ij} = \mu + \alpha_i + \beta_j + e_{ij}$
   b) $y_{ij} = \mu - \alpha_i - \beta_j - e_{ij}$
   c) $y_{ij} = \mu + e_{ij}$
   d) $y_{ij} = \beta_j + e_{ij}$

38. In ANOVA the assumption about the distribution of error terms e_{ij} is ...
   a) $e_{ij} \sim i.i.d\ N(0, 1)$
   b) $e_{ij} \sim i.i.d\ N(\mu, 1)$
   c) $e_{ij} \sim i.i.d\ N(\mu, \sigma_e{}^2)$
   d) $e_{ij} \sim i.i.d\ N(0, \sigma_e{}^2)$

39. Interaction effects are tested in ....
   a) ANOVA of One way classification
   b) ANOVA of Two way classification with one observation per cell
   c) ANOVA of Two way classification with m observations per cell
   d) None of the above

40. **In two way classification with one observation per cell involving factors A and B the Total Sum of Square is given by ....**
    a) $S_T^2 = S_A^2 + S_B^2 + S_E^2$
    b) $S_T^2 = S_A^2 + S_E^2$
    c) $S_T^2 = S_B^2 + S_E^2$
    d) None of the above

Note: Where Total Sum of Square $= S_T^2$, Sum of Square due to factor $A = S_A^2$
Sum of Square due to factor $B = S_B^2$ and Sum of Square due to Error $= S_E^2$

41. **The subject design of experiments was founded by ....**
    a) Cochran W. G.
    b) Cox G. M.
    c) Fisher R. A.
    d) Snedecor G. W.

42. **The principles of design of experiments are .....**
    a) Randomization and Local Control
    b) Replication and Randomization
    c) Replication and Local Control
    d) Replication, Randomization and Local Control

43. **The term C.R.D. stands for ....**
    a) Completely Randomised Design
    b) Completely Regularised Design
    c) Common Randomised Design
    d) Common Regularised Design

44. **A linear mathematical model of C R D is ......**
    a) $y_{ij} = \mu - t_i - e_{ij}$
    b) $y_{ij} = \mu + t_i$
    c) $y_{ij} = \mu + t_i + e_{ij}$
    d) $y_{ij} = \mu + e_{ij}$

45. **Which Principle is not used in CRD?**
    a) Randomization
    b) Local control
    c) Replication
    d) None of the above

46. **For the randomized block design with b blocks and t treatments, the total number of experimental units required are ....**
    a) b + t
    b) b x t
    c) b - t
    d) t − b

47. A linear mathematical model of RBD is ..
   a) $y_{ij} = \mu + t_i + b_j + e_{ij}$
   b) $y_{ij} = \mu - t_i - b_j - e_{ij}$
   c) $y_{ij} = \mu + b_j + e_{ij}$
   d) $y_{ij} = b_j + e_{ij}$

48. Which principles of design of experiments are used in RBD ?
   a) Local control and Randomisation
   b) Local control and Replication
   c) Randomisation and Replication
   d) Replication, Randomisation and Local control

49. Which of the following statement is true in most types of experimental works?
   a) RBD is less efficient than CRD
   b) RBD is more efficient than CRD
   c) Both RBD and CRD are equally efficient
   d) None of the above

50. In RBD with b blocks and t treatments, the number of degrees of freedom for error sum of square are ....
   a) b x t
   b) (b x t) - 1
   c) (b-1) x (t – 1)
   d) (b+1) x (t + 1)

51. In LSD ....
   a) Number of rows = Number of columns
   b) Number of rows > Number of columns
   c) Number of rows < Number of columns
   d) None of the above

52. LSD is incomplete ----------
   a) two way layout.
   b) one way layout.
   c) three way layout.
   d) None of these.

53. In 5x5 LSD the total number of experimental units will be ......
   a) 10
   b) 25
   c) 15
   d) 5

54. LSD stands for ....
   a) Least square design
   b) Latin square design
   c) List square design
   d) None of the above

55. In 2^2 Factorial experiment the total number treatment combinations are .....
   a) 2
   b) 6
   c) 8
   d) 4

56. In 2^3 Factorial experiment the total number treatment combinations are .....
   a) 8
   b) 6
   c) 12
   d) 4

57. In (m x m) LSD the degrees of freedom for rows are .....
   a) m
   b) (m+1)
   c) (m-1)
   d) (m – 2)

58. In LSD we are testing that ....
   a) Rows are homogeneous
   b) Columns are homogeneous
   c) Treatments are homogeneous
   d) All of the above

59. In LSD the total sum of square (TSS) is ....
   a) TSS = SSR + SSC + SST + SSE
   b) TSS = SSR + SST + SSE
   c) TSS = SSR + SSC + SSE
   d) TSS = SSC + SST + SSE

60. Which method is used in factorial experiments to obtain sum of squares?
   a) Fisher's method
   b) Yate's Method
   c) Pearson's Method
   d) None of the above

61. A minimization problem can be converted into a maximization problem by changing the sign of coefficients in the ……..

62. ANOVA of experimental data is based on assumptions that …….

63. Assignment problem is special case of …….

64. Assignments of Task to Person in Assignment Problem are made on ……

65. Basic purpose of ANOVA is to test ……..

66. Concept of ANOVA was introduced by…………

67. CRD are suitable in situation when ……….

68. Degrees of Freedom for Errors with N quantities with k treatments in one way classification are ……….

69. Error sum of squares in RBD as compared to CRD using same material is ………..

70. Find odd term out ……….

71. Following is method for obtaining initial solution to Transportation Problem ………
72. For using Hungarian Assignment Algorithm, the Assignment Problem must be …….
73. Full form of ANOVA is …….
74. Full form of CRD is …….
75. Full form of LSD …….
76. Full form of R.B.D. is ……..
77. Graphic method can be applied to solve a LPP when there are only ……..
78. Hungarian Assignment Algorithm is developed by ……..
79. If in a LPP, the solution of a variable can be made infinitly large without violating the constraints the solution is
80. In 2 cube factorial experiment means
81. In 2 square factorial experiment all effects and there sum of squares cab be obtained directly at a stretch by …….
82. In 2 square factorial experiments there are ……
83. In 4 X 4 LSD the degrees of freedom for total sum of squares are ……
84. In 5 X 5 LSD there are in all observations …….
85. In balanced Transportation Problem …..
86. In CRD with v treatments and N total number of units , treatment degrees of freedom is equal to ……
87. In LSD number of row, columns & treatments are ……
88. In m x m LSD the error degrees of freedom are ……
89. In matrix minima method allocation is made at cell with …….
90. In North West corner method allocation is made in the cell situated at……
91. In one way classification the formula of error sum of squares is equal ……
92. In one way classification with more than one treatment, the equality of treatment means is tested by…….. test
93. In the Analysis of Data of R B D which r blocks and v treatments, the error degrees of freedom are ……
94. In the case of <= inequality constraints the variables added are called as …….
95. In the case of >= inequality constraints the variables added are called as …….
96. In TP Initial basic feasible solution very close to Optimum Solution is obtained with
97. In Transportation Problem objective is to ……
98. In ……….. row and column cost differences are computed
99. Local Control in Experimental design is meant to …….
100. LSD is a ……
101. Maximization of objective function in LPP means …….
102. Mean sum of squares in ANOVA is equal to …….
103. Operations Research (OR) , which is a very powerful tool for ……
104. Optimum Sequence Algorithm to solve Sequencing Problem is ……..
105. R B D has ………
106. Randomization is a process in which treatments are allocated to the experimental units at ……..
107. Replication in an experiment means …….
108. The experiment in which the effects of level of factor are considered at various levels of other factor are called ………
109. The game is called fair if the value of the game is …….

110. The null hypothesis in ANOVA is accepted when …….
111. The objective function for a L.P model is 4X1 + 3X2, if X1 = 10 and X2 = 15, what is the value of the objective function?
112. Operations Research was discovered during……..
113. Total variation in any set of numerical data is due to ……. causes and ……. Causes.
114. Transportation Problem is subclasses of …….
115. When there are two competitors playing a game it is called ………
116. Who coined the term Operations Research?........
117. Zero sum game with two players means………