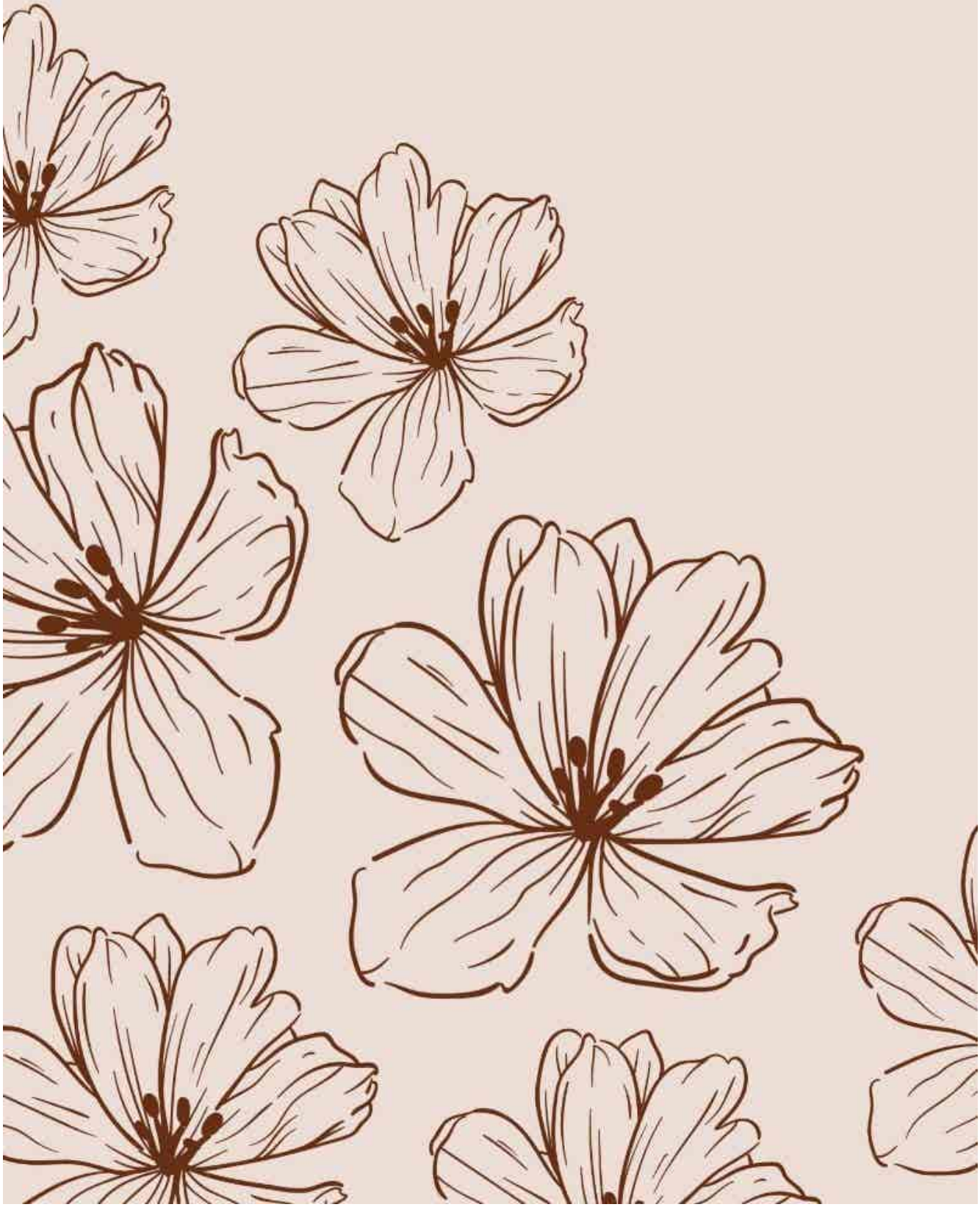
# MCQ ON OPERATIONS RESEARCH



St. Joseph's College of Arts and Science for Women, Hosur

# MCQ ON OPERATIONS RESEARCH

## UNIT-1

Introduction to operations research – meaning – scope - uses - advantages and limitations of operations research Linear Programming Problems - Formulations of LPP - Graphical method - simplex method (simple problems)

## UNIT-II

Transportation models – meaning – definition - basic feasible solution - North West Corner Rule (NWCR), Least Cost Method (LCM), Vogel's Approximation Method (VAM), MODI method.

## UNIT-III

Assignment problems - meaning – Definition - Application of assignment problems Game theory - Basic terminologies – twoperson zero sum game-games with saddle point - (MiniMax, Maximin principles). Mixed strategy problem - Dominance property (simple problems).

## UNIT-IV

Network analysis - construction of network. Time and critical path calculations, PERT- Programme Evaluation Review Technique - meaning – Problem , CPM and PERT comparison.

## UNIT-V

Decision theory - decision making under the condition of uncertainty, Maximax criterion, Minimax criterion, Hurwicz criterion, Laplace criterion. Decision making under risk – Expected value Criterion, Expected Opportunity Loss (EOL). Expected value of Perfect Information(EVPI).

# INDEX

## UNIT-1

1. What is the primary objective of Operations Research (OR)?
a. Minimize costs b. Maximize profits
c. Optimize decision-making d. Improve product quality

2. Which technique is used for finding the best solution to a problem among a set of feasible solutions?
a. Linear Programming b. Simulation
c. Queuing Theory d. Network Analysis

3. What is the purpose of a decision variable in OR?
a. Measure performance b. Represent decision options
c. Capture uncertainty d. Analyze historical data

4. In OR, what does the term "sensitivity analysis" refer to?
a. Analyzing employee performance
b. Evaluating the impact of parameter changes
c. Assessing market trends
d. Studying customer preferences

5. Which OR technique is used for optimizing resource allocation in a network of interconnected activities?
a. Critical Path Method (CPM) b. PERT
c. Queuing Theory d. Decision Trees

6. What does the acronym PERT stand for in Operations Research?

a. Program Evaluation and Review Technique
b. Probability and Event Response Time
c. Project Execution and Resource Tracking
d. Performance Evaluation and Result Time

7. Which type of problem involves finding the best way to allocate resources to maximize output?

a. Transportation Problem b. Assignment Problem
c. Allocation Problem d. Network Flow Problem

8. In linear programming, what is the feasible region?

a. Region with optimal solutions
b. Region outside the constraints
c. Region satisfying all constraints
d. Region with infeasible solutions

9. What does the term "Queuing Theory" focus on in OR?

a. Resource allocation
b. Project scheduling
c. Waiting lines and service systems
d. Decision analysis

10. Which method is used to analyze the impact of uncertainty in decision-making?

a. Sensitivity Analysis b. Simulation

c. Linear Programming d. Decision Trees

11.What is the primary goal of linear programming?
a. Maximizing profits b. Minimizing costs
c. Both A and B d. Neither A nor B

12. In linear programming, what is a feasible solution?
a. A solution that meets all constraints
b. A solution that maximizes the objective function
c. A solution with the highest variable values
d. A solution that minimizes the objective function

13. What is the graphical method used for in linear programming?
a. Solving equations b. Finding optimal solutions
c. Plotting data points d. Calculating derivatives

14. Which of the following is a constraint in linear programming?
a. Objective function b. Decision variables
c. Feasible region d. Slack variable

15. What is the significance of the isoprofit line in linear programming?
a. It represents the profit-maximizing solution
b. It connects points with equal profit
c. It shows the feasible region
d. It is unrelated to linear programming

16. Which method is commonly used to solve linear programming problems with a large number of variables and constraints?

a. Graphical method
b. Simplex method
c. Dual simplex method
d. Interior-point method

17. What does the term "binding constraint" mean in linear programming?

a. A constraint that is not relevant
b. A constraint that does not affect the solution
c. A constraint that limits the feasible region
d. A constraint that is easy to satisfy

18. In linear programming, what does a shadow price represent?

a. The cost of additional resources
b. The sensitivity of the objective function to a unit change in the right-hand side of a constraint
c. The maximum profit
d. The slope of the isoprofit line

19. What is the purpose of the dual problem in linear programming?

a. To find alternative solutions
b. To maximize the objective function
c. To minimize the objective function
d. To simplify the constraints

20. Which of the following statements is true about degeneracy in linear programming?
a. It improves the solution quality
b. It occurs when there are too many constraints
c. It can lead to cycling in the simplex method
d. It is not relevant to linear programming

21. What is the primary goal of formulating a Linear Programming Problem (LPP)?
a. Minimize complexity b. Maximize profits
c. Minimize cost d. Maximize variables

22. In a typical LPP, what are the decision variables?
a. Variables that are predetermined
b. Variables to be decided
c. Variables with non-linear relationships
d. Constants

23. What is the feasible region in LPP?
a. Region with maximum profit
b. Region satisfying all constraints
c. Region with minimum cost
d. Region with non-linear relationships

24. Which of the following is not a component of an LPP?
a. Objective function b. Decision variables

c. Constraints d. Constants

25. What does the objective function of an LPP represent?
a. Constraints to be satisfied b. Variables to be decided
c. Goal to be optimized d. feasible solutions

26. In a maximization problem, what type of relationship does the objective function have with the decision variables?
a. Linear b. Non-linear
c. Constant d. Inverse

27. What is the purpose of constraints in an LPP?
a. To limit the decision variables
b. To maximize the objective function
c. To minimize the objective function
d. To introduce non-linearity

28. What does the term "binding constraint" mean in the context of LPP?
a. Constraint with a slack variable
b. Constraint with a surplus variable
c. Constraint at its limit
d. Non-linear constraint

29. Which method is commonly used to solve LPP graphically?

a. Simplex method
b. Dual simplex method
c. Graphical method
d. Sensitivity analysis

30. What is the purpose of the simplex method in solving LPP?
a. To visualize solutions graphically
b. To solve non-linear problems
c. To optimize linear objective functions
d. To introduce non-linearity

31. What is the graphical method used for in operations research?
a. Cost estimation
b. Linear programming
c. Project scheduling
d. Inventory management

32. In a linear programming problem, what is the feasible region?
a. Region containing all optimal solutions
b. Region containing all feasible solutions
c. Region containing all infeasible solutions
d. Region containing only corner points

33. What does the objective function in linear programming represent?
a. Constraints to be maximized
b. Constraints to be minimized
c. Profit or cost function to be optimized
d. Feasible solutions

34. In a graphical solution, what do the corner points of the feasible region represent?

a. Optimal solutions
b. Infeasible solutions
c. Non-linear constraints
d. Feasible solutions

35. How many variables can be graphically represented in a two-dimensional linear programming problem?

a. One
b. Two
c. Three
d. Four

36. What is the slope of the line representing a constraint in a linear programming problem?

a. Intercept
b. Coefficient
c. Shadow price
d. Ratio of coefficients

37. What does the shadow price represent in linear programming?

a. Change in objective function value per unit change in the right-hand side of a constraint
b. Feasible solution
c. Optimal solution
d. Change in constraint coefficients

38. In a maximization problem, when is the graphical solution unbounded?

a. No feasible region exists

b. The objective function is parallel to a constraint
c. The objective function is perpendicular to a constraint
d. The feasible region is non-convex

39. What is the graphical representation of a binding constraint?

a. Dotted line b. Dash-dotted line
c. Solid line d. No line is drawn

40. Which graphical region indicates infeasibility?

a. Area above the line
b. Area below the line
c. Area between lines
d. No graphical region indicates infeasibility

41. What is the simplex method used for?

a. Linear programming b. Quadratic programming
c. Nonlinear programming d. Integer programming

42. In linear programming, what does the term "simplex" refer to?

a. A type of constraint b. A linear equation
c. A geometric shape d. A mathematical transformation

43. What is the main goal of the simplex method?

a. Maximizing profits
b. Minimizing costs
c. Finding feasible solutions

d. Optimizing a linear objective function

44. How many types of variables are there in the simplex method?

a. 1 b. 2

c. 3 d. 4

45. What is the purpose of slack variables in the simplex method?

a. Introducing non-linearity

b. Transforming inequalities into equalities

c. Reducing the number of variables

d. Handling integer constraints

46. In the simplex tableau, what does the pivot element represent?

a. The objective function coefficient

b. A decision variable

c. The current solution value

d. The variable to enter or leave the basis

47. What does the term "basic feasible solution" refer to in the simplex method?

a. An optimal solution

b. A solution with all variables at their upper bounds

c. A feasible solution with a minimal cost

d. A solution with only basic variables

48. Which rule is used to select the entering variable in the simplex method?

a. Minimum ratio rule b. Maximum coefficient rule
c. Minimum coefficient rule d. Maximum ratio rule

49. What is the significance of the term "degeneracy" in the simplex method?

a. Unbounded solution b. Multiple optimal solutions
c. Infeasible solution d. Cycling during optimization

50. What does the optimality criterion check in the simplex method?

a. If the solution is feasible
b. If the solution is optimal
c. If the objective function is linear
d. If there are multiple solutions

51. Which of the following is a drawback of the simplex method?

a. Limited applicability b. Slow convergence
c. Sensitivity to initial solution d. All of the above

52. What does the Big-M method handle in the simplex method?

a. Nonlinear constraints b. Integer constraints
c. Infeasible solutions d. Unbounded solutions

53. In the two-phase simplex method, what is the purpose of the first phase?
a. Finding the optimal solution
b. Identifying infeasibility or unboundedness
c. Introducing slack variables
d. Handling non-linear constraints

54. What does the term "artificial variable" represent in the simplex method?
a. A variable introduced to handle infeasibility
b. A decision variable in the original problem
c. An extra variable to speed up convergence
d. A variable that violates constraints

55. What happens when the objective function coefficient of an artificial variable becomes zero?
a. The variable remains in the basis
b. The variable is removed from the basis
c. The problem becomes infeasible
d. The artificial variable is replaced with a slack variable

**Answers**

1.c, 2.a, 3.b, 4b, 5.a, 6.a, 7.c, 8.c, 9.c, 10.b, 11.c, 12.a, 13.b, 14.d, 15.b, 16.b, 17.c, 18.b, 19.a, 20.c, 21.c, 22.b, 23.b, 24.d, 25.c, 26.a, 27.a, 28.c, 29.c, 30.c, 31.b, 32.b, 33.c, 34.a, 35.b, 36.d, 37.a, 38.b, 39.c, 40.d, 41.a, 42.c, 43.d, 44.b, 45.b, 46.d, 47.d, 48.d, 49.d, 50.b, 51.d, 52.c, 53.b, 54.a, 55.b.

## UNIT-2

1. What is the primary objective of transportation models in operations research?
a. Minimize transportation cost
b. Maximize transportation time
c. Minimize production cost
d. Maximize production time

2. In transportation models, what does a cell in the transportation table represent?
a. Source b. Destination
c. Both source and destination d. Transportation cost

3. What type of transportation model deals with unbalanced supply and demand?
a. Balanced Transportation Model
b. Unbalanced Transportation Model
c. Transshipment Model
d. Assignment Model

4. In the transportation model, the supply constraints must be equal to:
a. Total demand b. Total supply
c. Average demand d. Average supply

5. What method is commonly used to solve transportation problems?

a. Linear Programming
b. Monte Carlo Simulation
c. Decision Trees
d. Regression Analysis

6. In the transportation model, what is the condition for a feasible solution?
a. Total supply equals total demand
b. Total supply is greater than total demand
c. Total supply is less than total demand
d. Total supply and total demand are irrelevant

7. What does the term "degeneracy" refer to in transportation models?
a. Unbalanced supply and demand
b. Excess supply
c. Extra demand
d. Occurrence of cycles in the solution

8. What does the term "MODI method" stand for in transportation models?
a. Modified Distribution Method
b. Modified Differentiation Method
c. Method of Optimal Distribution Improvement
d. Method of Optimal Distribution Iterations

9. What is the purpose of the stepping-stone method in transportation models?
a. To identify the optimal solution
b. To identify degeneracy

c. To improve the initial feasible solution
d. To calculate transportation costs

10. In transportation models, what is a "closed loop"?
a. A method to close the problem without solution
b. A method to improve the initial solution
c. A set of cells forming a loop in the solution
d. A method for unbalanced transportation problems

11. Which technique is used to solve transportation problems with nonlinear cost functions?
a. Dynamic Programming b. Genetic Algorithms
c. Simulated Annealing d. Nonlinear Programming

12. What is the main drawback of the Northwest Corner Method in solving transportation problems?
a. It may not yield an optimal solution
b. It is computationally expensive
c. It requires additional iterations
d. It only works for balanced transportation problems

13. What is the significance of the "dummy row" or "dummy column" in transportation models?
a. To represent non-existent sources or destinations
b. To increase total supply
c. To decrease total demand
d. To balance supply and demand

14. When is the Vogel's Approximation Method (VAM) typically preferred in solving transportation problems?
a. For its simplicity
b. For unbalanced transportation problems
c. For large-scale problems
d. For its accuracy

15. What type of transportation model involves intermediate points for transferring goods?
a. Transshipment Model b. Assignment Model
c. Shortest Path Model d. Network Flow Model

16. What is a Basic Feasible Solution (BFS) in linear programming?
a. Any feasible solution
b. A solution with the maximum objective function value
c. A solution that satisfies all constraints with at least one equality
d. A solution that satisfies only some constraints

17. How many basic variables are there in a basic feasible solution with m equations and n variables?
a. m b. n
c. m + n d. m - n

18. In a basic feasible solution, non-basic variables are set to:
a. Any real values b. Zero

c. One d. Their maximum value

19. What does the feasible region represent in linear programming?
a. The region where constraints are violated
b. The region where the objective function is maximized
c. The region where both constraints and the objective function are satisfied
d. The region where the objective function is minimized

20. How many basic feasible solutions can a linear programming problem have?
a. Zero b. Exactly one
c. At least one d. Infinitely many

21. What is the significance of a degenerate basic feasible solution?
a. It violates constraints
b. It is infeasible
c. It is at the intersection of more than m constraints
d. It is not unique

22. In a linear programming problem, if the feasible region is unbounded, what does it imply?
a. No feasible solution exists
b. There are infinitely many feasible solutions
c. There is a unique feasible solution
d. The problem is infeasible

23. What does the pivot element in the simplex method represent?
a. A basic variable
b. A non-basic variable
c. A coefficient in the objective function
d. A constraint

24. What is the purpose of the simplex method in linear programming?
a. To find all feasible solutions
b. To find the optimal solution
c. To check feasibility
d. To add constraints

25. Which of the following statements about a feasible solution is true?
a. It is always optimal
b. It may or may not be optimal
c. It is infeasible
d. It violates constraints

26. In linear programming, what does the term "binding constraint" refer to?
a. A constraint with a slack variable
b. A constraint with a surplus variable
c. A constraint that is satisfied with equality
d. A constraint that is not satisfied

27. What is the role of the objective function in linear programming?
a. To define constraints
b. To maximize or minimize a certain quantity
c. To determine feasibility
d. To add variables

28. In the transportation problem, what does a basic feasible solution represent?
a. An optimal solution
b. A feasible solution with the maximum cost
c. A feasible solution with the minimum cost
d. An infeasible solution

29. What does the term "slack variable" signify in linear programming?
a. A variable with a positive coefficient in the objective function
b. A variable with a negative coefficient in the objective function
c. A variable added to convert inequalities to equalities
d. A variable indicating infeasibility

30. How can you identify an unbounded solution in linear programming?
a. The feasible region is a closed and bounded set
b. The feasible region is a closed set

c. The objective function has no maximum or minimum value
d. The feasible region is an open set

31. What is the North West Corner Rule used for in Operations Research?
a. Minimizing costs
b. Maximizing profits
c. Initial solution for transportation problems
d. Finding critical paths in a project

32. In the North West Corner Rule, which cell of the cost matrix is selected first?
a. Bottom right b. Top left
c. Bottom left d. Top right

33. How is the allocation made in the North West Corner Rule?
a. Diagonal b. Horizontal
c. Vertical d. Random

34. The North West Corner Rule is commonly used for solving which type of problem?
a. Linear programming b. Assignment
c. Queuing d. PERT analysis

35. What does each cell in the cost matrix represent in a transportation problem?
a. Time b. Distance

c. Cost d. Quantity

36. After the initial allocation in the North West Corner Rule, what is the next step?
a. Modify costs b. Optimize routes
c. Check for optimality d. Update supply and demand

37. In the North West Corner Rule, what does each row and column represent?
a. Sources and destinations b. Costs and quantities
c. Time and distance d. Optimal routes

38. Which of the following is NOT a step in the North West Corner Rule?
a. Allocate b. Optimize
c. Check for optimality d. Update supply and demand

39. What is the objective of the North West Corner Rule?
a. Maximizing total cost
b. Minimizing total cost
c. Equalizing supply and demand
d. Maximizing profit

40. How is the initial allocation made in the North West Corner Rule?
a. Minimizing cost
b. Maximizing profit

c. Maximizing quantity
d. Equalizing supply and demand

41. What is the significance of the North West Corner in the cost matrix?
a. Highest cost b. Lowest cost
c. Average cost d. Random cost

42. In the North West Corner Rule, what is modified during the optimization step?
a. Supply and demand b. Costs in the allocated cells
c. Initial allocation d. Transportation routes

43. What is the main advantage of the North West Corner Rule?
a. It guarantees an optimal solution
b. It is quick and simple
c. It handles complex problems efficiently
d. It is suitable for non-linear programming

44. Which of the following is a limitation of the North West Corner Rule?
a. It may not lead to an optimal solution
b. It is time-consuming
c. It is suitable only for small problems
d. It requires advanced mathematical techniques

45. What is the role of the North West Corner Rule in solving transportation problems?
a. It provides the final solution
b. It serves as a starting point for other methods
c. It is used only for cost estimation
d. It is irrelevant in transportation problems

46. What is the least-cost method used for in operations research?
a. Resource allocation b. Project scheduling
c. Quality control d. Demand forecasting

47. In the least-cost method, what is the primary objective?
a. Maximize profits b. Minimize costs
c. Optimize production d. Maximize efficiency

48. Which of the following is a characteristic of the least-cost method?
a. Maximizing revenue b. Minimizing waste
c. Equal distribution d. Random allocation

49. What type of problem does the least-cost method commonly address?
a. Linear programming b. Nonlinear programming
c. Integer programming d. Dynamic programming

50. How are costs assigned in the least-cost method?

a. Randomly
b. Proportional to demand
c. Based on historical data
d. Minimally to meet requirements

51. What is the role of the least-cost method in transportation problems?
a. Identifying bottlenecks
b. Allocating resources efficiently
c. Project scheduling
d. Quality control

52. In the least-cost method, what is the significance of the opportunity cost?
a. It is ignored b. It is maximized
c. It is minimized d. It is equal to actual cost

53. What is the primary constraint addressed by the least-cost method?
a. Time b. Space
c. Resources d. Quality

54. In the least-cost method, what does a zero-cost cell indicate?
a. Unfeasible solution b. Optimal solution
c. Excessive cost d. Undefined solution

55. Which algorithm is often used with the least-cost method in solving transportation problems?

a. Dijkstra's algorithm b. Bellman-Ford algorithm
c. Hungarian algorithm d. Prim's algorithm

56. What is the primary advantage of the least-cost method?
a. Simplicity b. Speed
c. Precision d. Flexibility

57. How does the least-cost method handle degeneracy in linear programming problems?
a. Ignores degeneracy b. Solves degeneracy separately
c. Increases costs d. Uses random allocation

58. What is the significance of the northwest corner method in the least-cost method?
a. Initial solution b. Final solution
c. Cost adjustment d. Quality control

59. Which phase of the least-cost method involves adjusting the costs to improve the solution?
a. Initialization b. Optimization
c. Sensitivity analysis d. Feasibility check

60. What is the main limitation of the least-cost method?
a. Inaccuracy b. Lack of flexibility
c. Complexity d. Sensitivity to initial solution

61. What is Vogel's Approximation Method (VAM) primarily used for in Operations Research?

a. Linear Programming b. Simulation

c. Forecasting d. Regression Analysis

62. In VAM, what does the term "penalty cost" refer to?

a. Cost associated with decision variables

b. Additional cost incurred for not selecting the optimal route

c. Cost of constraints violation

d. Cost of alternative solutions

63. How does Vogel's Approximation Method handle degeneracy in a transportation problem?

a. Ignores degeneracy

b. Resolves degeneracy by breaking ties randomly

c. Resolves degeneracy by introducing artificial variables

d. Resolves degeneracy through iteration

64. What is the main advantage of Vogel's Approximation Method over the Northwest Corner Method?

a. Faster computation

b. Guarantees an optimal solution

c. Addresses degeneracy

d. Considers opportunity costs

65. In VAM, what does an unoccupied cell with the largest penalty cost indicate?
a. Optimal solution b. Infeasible solution
c. Alternative optimal solution d. Degenerate solution

66. How does Vogel's Approximation Method find the initial basic feasible solution?
a. Randomly selects cells
b. Uses the highest cost cells
c. Utilizes the northwest corner cells
d. Minimizes the penalty costs

67. What is the computational complexity of Vogel's Approximation Method?
a. Polynomial time b. Exponential time
c. Logarithmic time d. Constant time

68. In a transportation problem, what does the term "supply" refer to?
a. Demand at a destination
b. Quantity available at a source
c. Transportation cost
d. Opportunity cost

69. Which step is NOT involved in Vogel's Approximation Method?
a. Calculate penalty costs
b. Choose the cell with the highest penalty cost

c. Allocate as much as possible to the chosen cell
d. Update supplies and demands

70. What type of optimization problem does Vogel's Approximation Method specifically address?
a. Non-linear programming b. Integer programming
c. Dynamic programming d. Linear programming

71. How does Vogel's Approximation Method contribute to solving transportation problems?
a. Finds an initial basic feasible solution
b. Improves the objective function value
c. Introduces artificial variables
d. Resolves infeasible solutions

72. What happens if all the allocations in the transportation problem are integers?
a. VAM cannot be applied
b. The problem becomes degenerate
c. VAM guarantees an optimal solution
d. The problem becomes an integer programming problem

73. What does the optimality condition in Vogel's Approximation Method involve?
a. Minimizing the total cost
b. Maximizing the total profit
c. Minimizing the total penalty cost

d. Equalizing supplies and demands

74. When does VAM become inefficient in solving transportation problems?
a. Large problem size
b. Small problem size
c. When there are no penalty costs
d. When all costs are equal

75. Which phase of the transportation problem does VAM address?
a. Formulation b. Optimization
c. Sensitivity analysis d. Post-optimality analysis

76. What is the Modi method used for in operations research?
a. Inventory Management b. Linear Programming
c. Quality Control d. Project Scheduling

77. In linear programming, what does MODI stand for?
a. Modified Optimality Determination Iteration
b. Modified Distribution
c. Matrix Optimization and Iteration
d. Method of Optimized Deterministic Iterations

78. What is the primary objective of the Modi method?
a. Maximizing Profit b. Minimizing Cost
c. Minimizing Time d. Optimizing Resources

79. In the Modi method, what does the term "Modified" refer to?
a. Adaptation to changing constraints
b. Adjusting the transportation matrix
c. Changes in the objective function
d. Modification of initial basic feasible solution

80. Which phase of the transportation problem does the Modi method primarily focus on?
a. Initialization b. Allocation
c. Testing Optimality d. Iterative Improvement

81. What does the Modi method use to identify the non-basic variables?
a. Least Cost Rule
b. North-West Corner Rule
c. Vogel's Approximation Method
d. Stepping-Stone Method

82. In the Modi method, which variable is adjusted to improve optimality?
a. Basic Variable b. Non-Basic Variable
c. Slack Variable d. Surplus Variable

83. What is the role of the stepping-stone method in the Modi algorithm?
a. Initialization of variables
b. Identification of optimal solution

c. Adjustment of non-basic variables
d. Calculation of transportation costs

84. How is the optimality test performed in the Modi method?
a. Vogel's Approximation Method
b. Least Cost Rule
c. Stepping-Stone Method
d. North-West Corner Rule

85. What does a positive improvement value for a non-basic variable indicate in the Modi method?
a. Improved Optimality b. Worsened Optimality
c. No Change in Optimality d. Infeasibility

86. Which iteration technique is used to achieve optimality in the Modi method?
a. Simplex Method b. Gaussian Elimination
c. Gauss-Jordan Elimination d. Modified Distribution

87. What is the significance of the Northwest Corner Rule in the Modi method?
a. Initialization of basic feasible solution
b. Identification of optimal solution
c. Adjustment of non-basic variables
d. Testing optimality conditions

88. What is the primary advantage of the Modi method?

a. Simplicity of implementation
b. Speed of convergence
c. Applicability to non-linear problems
d. Accuracy in complex scenarios

89. In the Modi method, what does the term "Degeneracy" refer to?
a. Existence of multiple optimal solutions
b. Lack of feasible solutions
c. Infeasibility of the problem
d. Presence of redundant constraints

90. When is the Modi method most suitable for solving linear programming problems?
a. Large-scale problems with multiple constraints
b. Small-scale problems with few variables
c. Unstructured and dynamic problems
d. Problems with non-linear objective functions

**Answers**

1.a, 2.d, 3.b, 4.b, 5.a, 6.a, 7.d, 8.c, 9.a, 10.c, 11.d, 12.a, 13.a, 14.b, 15.a, 16.c, 17.a, 18.b, 19.c, 20.d, 21.c, 22.b, 23.a, 24.b, 25.b, 26.c, 27.b, 28.a, 29.c, 30.d, 31.c, 32.b, 33.a, 34.b, 35.c, 36.c, 37.a, 38.b, 39.b, 40.c, 41.b, 42.b, 43.b, 44.a, 45.b, 46.a, 47.b, 48.b, 49.a, 50.d, 51.b, 52.a, 53.c, 54.a, 55.c, 56.a, 57.b, 58.a, 59.c, 60.d, 61.a, 62.b, 63.b, 64.d, 65.c, 66.d, 67.a, 68.b, 69.b, 70.d, 71.a, 72.c, 73.c, 74.a, 75.b, 76.b, 77.a, 78.b, 79.d, 80.c, 81.a, 82.b, 83.c, 84.c, 85.a, 86.a, 87.a, 88.a, 89.a, 90.b.

## UNIT-3

1. What is the primary goal of an assignment problem?
a. Minimize total cost b. Maximize total profit
c. Minimize total time d. Maximize total efficiency

2. In assignment problems, what does the assignment matrix represent?
a. Costs associated with each assignment
b. Profit associated with each assignment
c. Time taken for each assignment
d. Efficiency of each assignment

3. Which method is commonly used to solve assignment problems?
a. Linear Programming b. Branch and Bound
c. Hungarian Method d. Greedy Algorithm

4. What is the characteristic of an optimal assignment in a minimization problem?
a. Maximum cost b. Minimum cost
c. Maximum profit d. Minimum profit

5. In the context of assignment problems, what does the term "unbalanced" refer to?
a. Incomplete assignments
b. Unequal assignment costs
c. Unequal number of jobs and workers

d. Unsolvable assignments

6. Which of the following methods is suitable for solving an unbalanced assignment problem?

a. Transportation Method b. Hungarian Method
c. Simplex Method d. Branch and Bound

7. What does the term "dummy row or column" represent in assignment problems?

a. An extra row or column added to balance the problem
b. A row or column with zero cost assignments
c. An unsolvable row or column
d. A row or column with maximum cost assignments

8. In the context of assignment problems, what is the assignment restriction?

a. Each job must be assigned to exactly one worker
b. Each worker must be assigned to exactly one job
c. Each job can be assigned to multiple workers
d. Each worker can be assigned to multiple jobs

9. What is the significance of the "exclusive" assignment constraint?

a. Each job can only be assigned to one worker
b. Each worker can only be assigned to one job
c. A job can be assigned to multiple workers
d. A worker can be assigned to multiple jobs

10. Which of the following is a valid technique for resolving ties in the assignment problem?
a. Random assignment
b. Assigning based on alphabetical order
c. Assigning based on the highest cost
d. Assigning based on the lowest cost

11. What does the term "opportunity cost" refer to in the context of assignment problems?
a. Cost of missed opportunities
b. The cost of assigning a worker to a job
c. The cost of not assigning a worker to a job
d. The cost of changing assignments

12. What is the time complexity of the Hungarian Method for solving assignment problems?
a. O(n) b. O(n log n)
c. O(n^3) d. O(n^2 log n)

13. In an assignment problem, what does a zero cost in the assignment matrix indicate?
a. Maximum cost b. Minimum cost
c. Unsolvable assignment d. Invalid assignment

14. When using the Hungarian Method, what does the term "augmenting path" refer to?
a. A path with maximum cost
b. A path with minimum cost

c. A path that increases the total cost
d. A path that decreases the total cost

15. What is the main advantage of the Hungarian Method over brute-force methods for solving assignment problems?
a. Lower time complexity
b. Higher accuracy
c. Simplicity of implementation
d. Flexibility in handling unbalanced problems

16. What is the primary focus of game theory in operations research?
a. Resource allocation b. Decision making
c. Strategic interactions d. Data analysis

17. In game theory, what is a Nash equilibrium?
a. A point of maximum payoff
b. A stable outcome where no player has an incentive to change their strategy
c. A situation with perfect information
d. A one-time optimal decision

18. What is a zero-sum game?
a. A game with no winners
b. A game where the total payoff remains constant
c. A game with multiple equilibria
d. A game with a variable number of players

19. In a mixed strategy, what does a player do?
a. Stick to a single strategy throughout the game
b. Randomly choose from a set of strategies with specific probabilities
c. Mimic the opponent's strategy
d. Always choose the strategy with the highest payoff

20. What does the concept of dominance in game theory refer to?
a. Stronger strategies dominating weaker ones
b. A player dominating the entire game
c. Strategies that always lead to a win
d. Strategies that are never chosen

21. In game theory, what does the term "payoff matrix" represent?
a. The cost of playing the game
b. The strategies chosen by players
c. The outcomes and associated payoffs for each player
d. The total number of moves in a game

22. When is a game considered a simultaneous game?
a. When players take turns making decisions
b. When players make decisions simultaneously
c. When the game has multiple rounds
d. When players cannot see each other's strategies

23. What does the concept of a "Pareto Optimal" outcome signify in game theory?
a. An outcome where one player dominates others
b. An outcome that maximizes the total payoff for all players
c. An outcome that minimizes the total payoff for all players
d. An outcome with no clear winner

24. In a two-player game, what is a "zero-sum" situation?
a. The total payoff is always zero
b. One player's gain is equal to the other player's loss
c. The players have zero strategies to choose from
d. The game has zero equilibrium points

25. What is the significance of the "minimax" strategy in game theory?
a. Maximizing the minimum payoff
b. Minimizing the maximum payoff
c. Equalizing payoffs for all players
d. Randomly choosing strategies

26. What is the primary goal of cooperative game theory?
a. Analyzing individual player strategies
b. Studying strategic interactions among players
c. Maximizing individual payoffs

d. Achieving mutually beneficial outcomes through cooperation

27. In repeated games, what strategy encourages cooperation by punishing defection?

a. Tit-for-tat b. Minimax

c. Nash equilibrium d. Mixed strategy

28. What does the concept of a "subgame" refer to in game theory?

a. A portion of the game that is analyzed in isolation

b. The final stage of the game

c. A game with a subset of players

d. A game with no equilibrium

29. What is the "tragedy of the commons" in game theory?

a. A situation where players collaborate for mutual benefit

b. The overuse or depletion of shared resources due to self-interest

c. A game with a particularly low total payoff

d. A game with no equilibrium points

30. How does the concept of "asymmetric information" impact game theory?

a. It ensures fairness in games

b. It levels the playing field for all players

c. It introduces variations in players' knowledge and information
d. It makes all players equally informed

31. What is a saddle point in game theory?
a. The winning strategy
b. A point of indifference
c. A strategy that guarantees a loss
d. A dominating strategy

32. In a two-player zero-sum game, what does zero-sum imply?
a. The sum of payoffs is zero
b. There are zero strategies
c. The game lasts for zero rounds
d. The players always tie

33. What is the main focus of operations research in the context of games?
a. Winning strategies b. Optimal decision-making
c. Random strategies d. Aggressive strategies

34. When does a game have a saddle point?
a. When there is no solution
b. When players always tie
c. When a mixed strategy is used
d. When both players have a best strategy

35. What is the significance of a saddle point in a game matrix?
a. It indicates a point of instability
b. It ensures a player's victory
c. It implies a mixed strategy
d. It guarantees a tie in the game

36. In a game matrix, what does a dominating strategy imply?
a. It guarantees a win
b. It is always chosen by a player
c. It dominates all other strategies
d. It is a mixed strategy

37. What is the Nash equilibrium in game theory?
a. A stable strategy b. A point of indifference
c. A dominating strategy d. A mixed strategy

38. How is the minimax theorem related to game theory?
a. It minimizes the number of players
b. It maximizes payoffs for both players
c. It minimizes the maximum possible loss
d. It maximizes the number of rounds in a game

39. What does the concept of a mixed strategy involve?
a. Combining different games
b. Using both pure and random strategies
c. Playing multiple games simultaneously

d. Mixing dominant strategies

40. In a zero-sum game, what is the relationship between one player's gain and the other player's loss?
a. They are independent
b. They are unrelated
c. They are inversely proportional
d. They add up to zero

41. How is a payoff matrix used in game theory?
a. To calculate winning probabilities
b. To represent strategies and payoffs
c. To determine the number of rounds
d. To randomize strategies

42. What does the concept of "maximin" refer to in game theory?
a. Maximizing the minimum payoff
b. Maximizing the average payoff
c. Maximizing the total payoff
d. Maximizing the winning probability

43. In a game matrix, what is a pure strategy?
a. A strategy with a certain probability
b. A mixed strategy
c. A deterministic strategy
d. A dominating strategy

44. What is the primary goal of a player in a zero-sum game?
a. To maximize their own gain
b. To minimize their own loss
c. To collaborate with the opponent
d. To maximize the opponent's loss

45. How does the concept of a Nash equilibrium differ from a saddle point?
a. They are synonymous
b. Nash equilibrium is always a saddle point
c. Saddle points involve mixed strategies
d. Nash equilibrium involves dominating strategies

46. What is the main objective of the minimax principle in decision making?
a. Minimize costs
b. Maximize profits
c. Minimize the maximum possible loss
d. Maximize the maximum possible gain

47. In game theory, the minimax strategy is associated with:
a. Maximizing own gains
b. Minimizing opponent's gains
c. Minimizing the maximum potential loss
d. Maximizing the sum of gains

48. The maxi min criterion in decision making is concerned with:
a. Maximizing the minimum possible gain
b. Minimizing the maximum possible loss
c. Maximizing the maximum possible gain
d. Minimizing the minimum possible loss

49. What is the primary focus of the maximax principle?
a. Maximizing the minimum possible loss
b. Maximizing the maximum possible gain
c. Minimizing the maximum possible loss
d. Minimizing the minimum possible gain

50. The minimax regret criterion is concerned with minimizing:
a. Maximum profit b. Maximum loss
c. Maximum regret d. Maximum gain

51. The maximum principle in optimization is used to find:
a. Minimum value of a function
b. Maximum value of a function
c. Both minimum and maximum values
d. Average value of a function

52. What does the dominance property in operations research refer to?
a. Minimizing objectives

b. Maximizing objectives
c. A solution that is better than another in all objectives
d. A solution that is worse than another in all objectives

53. In multi-objective optimization, which of the following is a dominating solution?
a. A solution with higher values in all objectives
b. A solution with lower values in all objectives
c. A solution with a mix of higher and lower values in objectives
d. A solution with similar values in objectives

54. When comparing solutions, what does Pareto dominance indicate?
a. One solution is better in all objectives
b. A trade-off between objectives
c. No clear dominance between solutions
d. Equal values in all objectives

55. Which Pareto front represents a better set of solutions?
a. Smaller Pareto front
b. Larger Pareto front
c. There is no relation between Pareto front size and solution quality
d. Medium-sized Pareto front

56. In Pareto dominance, what does it mean if two solutions are non-dominated?
a. They have equal values in all objectives
b. One solution is better in all objectives
c. No clear dominance between them
d. They are not considered in the optimization process

57. Which algorithm is commonly used for solving multi-objective optimization problems considering Pareto dominance?
a. Genetic Algorithm b. Linear Programming
c. Hill Climbing d. Breadth-First Search

58. The dominance property is essential in operations research to:
a. Minimize computation time
b. Evaluate the performance of algorithms
c. Increase the number of objectives
d. Avoid the use of optimization algorithms

59. What does it mean if a solution is Pareto efficient?
a. It dominates all other solutions
b. It is optimal in at least one objective
c. It is not dominated by any other solution
d. It has the highest overall objective values

60. In a Pareto front, what do points represent?
a. Dominated solution b. Non-dominated solutions

c. Average solutions d. Randomly selected solutions

61. Which of the following is a drawback of using dominance property in optimization?
a. Difficulty in implementation
b. Limited applicability to real-world problems
c. Sensitivity to initial conditions
d. Inability to handle multiple objectives

62. In the context of multi-objective optimization, what does a Pareto improvement signify?
a. Improvement in one objective without worsening others
b. Improvement in all objectives simultaneously
c. Worsening in one objective without improving others

63. Which Pareto front is considered better: concave or convex?
a. Concave Pareto front b. Convex Pareto front
c. Both are equally good d. Neither is preferred

64. In the dominance property, what does it mean if one solution is weakly dominated by another?
a. It is better in all objectives
b. It is worse in all objectives
c. It is better in at least one objective
d. It is worse in at least one objective

65. Which concept is closely related to Pareto dominance?

a. Nash Equilibrium
b. Game Theory
c. Local Minimum
d. Lexicographic Order

66. In a multi-objective problem, what is the role of a Pareto set?

a. It represents dominated solutions
b. It contains all non-dominated solutions
c. It includes average solutions
d. It denotes the best solution in all objectives

**Answers**

1.a, 2.a, 3.c, 4.b, 5.c, 6.a, 7.a, 8.b, 9.a, 10.b, 11.c, 12.c, 13.b, 14.d, 15.a, 16.c, 17.b, 18.b, 19.b, 20.a, 21.c, 22.b, 23.b, 24.b, 25.b, 26.d, 27.a, 28.a, 29.b, 30.c, 31.b, 32.a, 33.b, 34.d, 35.a, 36.c, 37.a, 38.c, 39.b, 40.d, 41.b, 42.a, 43.c, 44.b, 45.c, 46.c, 47.c, 48.a, 49.b, 50.a, 51.b, 52.c, 53.a, 54.b, 55.a, 56.c, 57.a, 58.b, 59.c, 60.b, 61.c, 62.a, 63.b, 64.c, 65.d, 66.b.

## UNIT-4

1. What is a critical path in a network diagram?

a. Longest path b. Shortest path

c. Path with least activities d. Path with most activities

2. What is the purpose of the forward pass in network analysis?

a. Identify late start times b. Identify early start times

c. Identify late finish times d. Identify early finish times

3. In PERT analysis, what does P stand for?

a. Project b. Program

c. Planning d. Probability

4. Which type of network diagram uses boxes to represent activities and arrows to show dependencies?

a. Gantt chart b. PERT diagram

c. CPM diagram d. WBS diagram

5. What does a dummy activity represent in a network diagram?

a. Real activity b. Time delay

c. Resource constraint d. Parallel activity

6. Which technique allows for the calculation of project duration with a range of possible outcomes?

a. CPM b. PERT

c. Gantt chart d. WBS

7. What does the critical path method (CPM) focus on?
a. Time estimates b. Resource allocation
c. Cost analysis d. Critical activities

8. What is the Slack or Float time in network analysis?
a. Time delay
b. Extra time for activities
c. Free time for project manager
d. Resource availability

9. What does crashing in project management refer to?
a. Reducing project scope
b. Accelerating project schedule
c. Increasing project budget
d. Adding more resources

10. Which type of dependency allows two activities to be performed simultaneously?
a. Finish-to-Start b. Start-to-Start
c. Finish-to-Finish d. Start-to-Finish

11. In network analysis, what does a circle represent?
a. Start or finish event b. Dummy activity
c. Critical activity d. Resource constraint

12. What is the purpose of the backward pass in network analysis?

a. Identify late start times b. Identify early start times
c. Identify late finish times d. Identify early finish times

13. Which type of analysis helps in resource leveling and allocation?

a. CPM b. PERT
c. Resource Analysis d. Resource Allocation Chart

14. What is the purpose of the activity-on-node (AON) diagram?

a. Show resource allocation
b. Show activity dependencies
c. Show project cost
d. Show project duration

15. What is the formula for calculating slack or float time?

a. Late Start - Early Start b. Late Finish - Early Finish
c. Early Start - Late Start d. Early Finish - Late Finish

16. Which analysis helps in identifying the most critical activities in a project?

a. PERT b. CPM
c. Critical Path Analysis d. Gantt chart

17. What is the primary use of a Gantt chart in project management?

a. Resource allocation b. Time scheduling
c. Cost estimation d. Risk analysis

18. In PERT analysis, what does the optimistic time estimate represent?
a. Most likely time b. Shortest time
c. Longest time d. Average time

19. What is the primary advantage of using network analysis in project management?
a. Cost control b. Resource optimization
c. Time management d. Quality assurance

20. What does PERT stand for?
a. Project Evaluation and Review Technique
b. Program Evaluation and Resource Technique
c. Project Execution and Reporting Technique
d. Program Execution and Resource Technique

21. In PERT, what does the term "slack" refer to?
a. Project delay
b. Time available for an activity without delaying the project
c. Resource shortage
d. Project acceleration

22. Which of the following is used to represent activities in a PERT network?

a. Arrows b. Circles
c. Rectangles d. Diamonds

23. What is the critical path in a PERT network?
a. The longest path in the network
b. The shortest path in the network
c. The path with maximum resource utilization
d. The path with minimum slack

24. PERT is most suitable for projects that involve:
a. Low uncertainty b. High uncertainty
c. No uncertainty d. Fixed timelines

25. In PERT analysis, what does the term "event" represent?
a. Time duration of an activity
b. Start or finish of an activity
c. Resources required for an activity
d. Cost of an activity

26. What is the purpose of a dummy activity in PERT?
a. To represent a non-essential task
b. To increase project duration
c. To allocate additional resources
d. To speed up project completion

27. PERT uses three time estimates for each activity. What are they?

a. Optimistic, Pessimistic, and Most Likely
b. Short, Medium, and Long
c. Early Start, Late Start, and Float
d. Fast, Normal, and Slow

28. The variance of an activity in PERT is calculated as:
a. (Pessimistic - Optimistic) / 4
b. (Pessimistic - Optimistic) / 6
c. (Pessimistic + Optimistic) / 2
d. (Pessimistic - Optimistic) / 2

29. What does the Critical Path Method (CPM) primarily focus on?
a. Resource allocation b. Project scheduling
c. Risk management d. Quality control

30. Which analysis helps in identifying the probability of completing the project on time?
a. Sensitivity analysis b. Monte Carlo simulation
c. Trend analysis d. Regression analysis

31. The Critical Path in a PERT network is the path with:
a. Maximum slack b. Minimum slack
c. Maximum variance d. Minimum variance

32. Which type of relationship exists between activities in a PERT network?

a. Finish-to-Start
b. Start-to-Finish
c. Start-to-Start
d. Finish-to-Finish

33. What is the purpose of the PERT chart?
a. Resource allocation
b. Risk analysis
c. Project scheduling and visualization
d. Quality assurance

34. In PERT, what does the term "float" represent?
a. The time an activity can be delayed without delaying the project
b. Resource availability
c. The duration of critical activities
d. The total project duration

35. What does CPM stand for in Operations Research?
a. Cost-Performance Management
b. Critical Path Method
c. Complex Project Modeling
d. Continuous Process Monitoring

36. In CPM, what does the term "Critical Path" represent?
a. Longest path in the project
b. Shortest path in the project
c. Average duration of all activities
d. Path with the least resource utilization

35. Which of the following is NOT a key component of CPM?

a. Activity
b. Node
c. Arrow
d. Branch

36. What does the term "Float" refer to in CPM?

a. Time an activity can be delayed without delaying the project
b. Time taken to complete an activity
c. Resource availability
d. Project cost variance

37. In CPM, what is the earliest start time of an activity?

a. Time when the activity is completed
b. Time when the activity starts
c. Time when all activities are finished
d. Time when the project starts

38. Which of the following is a network diagram used in CPM?

a. Gantt chart
b. PERT chart
c. Scatter plot
d. Histogram

39. What does the Critical Path Method primarily focus on?

a. Time management
b. Cost estimation
c. Resource allocation
d. Quality assurance

40. In CPM, which activity has zero float?

a. Non-critical activities b. Precedence activities
c. Critical activities d. Parallel activities

41. What does the term "Event" represent in CPM?

a. Duration of an activity
b. Milestone or a point in time
c. Resource requirement
d. Cost associated with an activity

42. Which technique is often used alongside CPM for project management?

a. Six Sigma b. PERT
c. SWOT analysis d. Kaizen

43. What is the purpose of the Forward Pass in CPM?

a. To calculate the late start times
b. To calculate the early start times
c. To determine critical activities
d. To identify the longest path

44. Which type of relationship between activities indicates that both activities can start simultaneously?

a. Start-to-Start b. Finish-to-Finish
c. Start-to-Finish d. Finish-to-Start

45. What does the term "Dummy Activity" represent in CPM?

a. An activity with uncertain duration
b. An activity with zero float
c. A virtual activity used to maintain logical relationships
d. A critical activity

46. What does crashing refer to in CPM?
a. Reducing the project scope
b. Accelerating the project schedule by allocating more resources
c. Extending the project duration
d. Modifying the critical path

47. What is the purpose of the Backward Pass in CPM?
a. To calculate the late finish times
b. To calculate the early finish times
c. To identify critical activities
d. To determine the longest path

**Answers**

1.a, 2.b, 3.a, 4.c, 5.b, 6.b, 7.a, 8.b, 9.b, 10.b, 11.a, 12.c, 13.a, 14.b, 15.b, 16.c, 17.b, 18.b, 19.c, 20.a, 21.b, 22.a, 23.a, 24.b, 25.b, 26.a, 27.a, 28.b, 29.b, 30.b, 31.b, 32.a, 33.c, 34.a, 35.b, 36.a, 37.b, 38.b, 39.a, 40.c, 41.b, 42.b, 43.b, 44.d, 45.c, 46.b, 47.a.

## UNIT-5

1. What is decision theory primarily concerned with?

a. Forecasting b. Optimization
c. Probability d. Simulation

2. What is the main purpose of a decision matrix in decision analysis?

a. Record historical decision
b. Evaluate decision alternatives
c. Simulate future scenarios
d. Calculate probabilities

3. In decision theory, what does the term "payoff" refer to?

a. The cost of decision analysis
b. The outcome or result of a decision
c. The probability of success
d. The time required for decision making

4. Which decision-making criterion considers the worst possible outcome?

a. Maximax b. Maximin
c. Minimax d. Minimin

5. What is the Hurwicz criterion in decision theory?

a. Maximizing the minimum
b. Minimizing the maximum

c. A compromise between optimism and pessimism
d. Maximizing the maximu

6. Which decision-making approach is based on assigning subjective probabilities?
a. Maximax b. Minimax
c. Expected Monetary Value (EMV) d. Laplace criterion

7. What does the term "regret" signify in decision theory?
a. The emotional aspect of decision-making
b. The difference between the actual and optimal outcomes
c. The probability of success
d. The cost of decision analysis

8. Which decision criterion seeks to maximize the product of probabilities and payoffs?
a. Maximax b. Minimax
c. Expected Monetary Value (EMV) d. Laplace criterion

9. In decision trees, what do branches represent?
a. Decision alternatives b. Probabilities
c. Payoffs d. All of the above

10. Which decision-making criterion is also known as the "regret criterion"?

a. Maximax
b. Minimax
c. Hurwicz
d. Laplace

11. What does the term "decision analysis" involve in operations research?
a. Analyzing past decisions
b. Analyzing decision alternatives
c. Analyzing probability distributions
d. Analyzing market trends

12. Which concept is fundamental to the Maximax criterion?
a. Maximizing probabilities
b. Maximizing payoffs
c. Minimizing regret
d. Compromise between optimism and pessimism

13. What is the main advantage of using decision trees in decision analysis?
a. Simplicity
b. Visual representation
c. Ignoring uncertainties
d. Focusing on regret

14. Which decision-making criterion is based on assigning equal probabilities to all outcomes?
a. Maximax
b. Minimax
c. Expected Monetary Value (EMV)
d. Laplace criterion

15. What does the Maximax criterion seek to achieve?

a. Minimizing the maximum regret
b. Maximizing the maximum payoff
c. Maximizing the minimum regret
d. Compromise between optimism and pessimism

16. The concept of "regret" in decision theory refers to:
a. The emotional feeling after making a decision
b. The difference between the actual outcome and the best possible outcome
c. Certainty in decision-making
d. The probability of success in a decision

17. What is the primary difference between decision making under certainty and decision making under risk?
a. Certainty involves known outcomes, while risk involves uncertain outcomes.
b. Certainty involves uncertain outcomes, while risk involves known outcomes.
c. Both involve the same level of uncertainty.

18. Which of the following is a common technique for decision making under risk?
a. Decision trees b. Certainty analysis
c. Linear programming

19. In decision making under risk, what does probability distribution represent?
a. Certain outcomes b. Uncertain outcomes

c. Expected outcomes

20. What is the purpose of an expected monetary value (EMV) in decision making under risk?
a. To calculate certain outcomes
b. To quantify the average value of uncertain outcomes
c. To eliminate risk

21. Which decision criterion seeks to maximize the maximum possible payoff?
a. Maximin b. Maximax
c. Minimax

22. What is the focus of the minimax regret criterion in decision making under risk?
a. Maximizing payoff b. Minimizing regret
c. Maximizing expected value

23. Which concept involves making a decision based on the best and worst outcomes for each alternative?
a. Decision trees b. Sensitivity analysis
c. Payoff table

24. In decision trees, what does a decision node represent?
a. End of the decision process
b. A point where decisions are made
c. A random event

25. What is the purpose of sensitivity analysis in decision making under risk?
a. To analyze the sensitivity of decisions to changes in parameters
b. To eliminate uncertainty
c. To calculate expected monetary value

26. Which probability distribution assumes all outcomes are equally likely?
a. Normal distribution b. Uniform distribution
c. Exponential distribution

27. What is the maximin criterion primarily concerned with?
a. Maximizing expected value
b. Minimizing regret
c. Maximizing the minimum possible payoff

28. What does the term "expected value" represent in decision making under risk?
a. The most likely outcome
b. The average value considering probabilities
c. The highest possible payoff

29. Which of the following is an advantage of using decision trees in decision making under risk?
a. Simplicity
b. Inability to represent uncertainty

c. Limited applicability

30. What is the primary drawback of the maximax criterion?
a. Ignores worst outcomes b. Ignores best outcomes
c. Ignores average outcomes

31. In decision making under risk, what does the term "regret" refer to?
a. The feeling of uncertainty
b. The difference between the best and worst outcomes
c. The opportunity cost of not choosing the best alternative

32. What does Expected Opportunity Loss (EOL) measure in decision theory?
a. Expected profit b. Potential gain
c. Potential loss d. Risk aversion

33. How is Expected Opportunity Loss calculated?
a. EOL = Probability × Gain
b. EOL = Probability × Loss
c. EOL = Gain / Probability
d. EOL = Loss / Probability

34. In decision analysis, what does the term "opportunity loss" refer to?
a. Gained benefits b. Missed opportunities

c. Avoided risks d. Certain outcomes

35. What does EVPI stand for in the context of operations research?
a. Expected Value of Projected Information
b. Expected Value of Perfect Information
c. Essential Value of Predictive Insight
d. Efficient Value of Probabilistic Inquiry

36. Which decision-making tool assesses the potential value of acquiring additional information?
a. Decision Trees b. Sensitivity Analysis
c. Expected Value d. EVPI Matrix

37. In decision analysis, what does "perfect information" imply?
a. Information without any errors
b. Information gathered at no cost
c. Information with 100% accuracy
d. Information obtained from multiple sources

38. How is EVPI calculated in decision analysis?
a. EVPI = EVwPI - EVw/oPI
b. EVPI = EVw/oPI - EVwPI
c. EVPI = EVwPI + EVw/oPI
d. EVPI = EVw/oPI / EVwPI

39. What does EVwPI represent in the EVPI formula?

a. Expected Value without Perfect Information
b. Enhanced Value with Probabilistic Insight
c. Estimated Value with Potential Information
d. Expected Value with Perfect Information

40. Which of the following statements is true regarding EVPI?
a. It is always negative.
b. It represents the maximum amount a decision-maker should pay for perfect information.
c. It is independent of the decision problem.
d. It is calculated after making the decision.

41. When would EVPI be zero in a decision problem?
a. When perfect information is not available.
b. When the decision has no uncertainty.
c. When the cost of acquiring perfect information is too high.
d. When the decision-maker is risk-averse.

42. What role does uncertainty play in the concept of EVPI?
a. Uncertainty increases the value of perfect information.
b. Uncertainty decreases the value of perfect information.
c. Uncertainty has no impact on the value of perfect information.
d. Uncertainty is not considered in EVPI calculations.

43. In a decision tree, what node represents the decision to gather perfect information?

a. Decision node
b. Chance node
c. End node
d. EVPI node

44. What is the primary limitation of relying solely on EVPI in decision-making?

a. Assumes perfect information is always available.
b. Ignores ethical considerations.
c. Doesn't consider the timing of information acquisition.
d. Assumes all decision-makers have the same risk tolerance.

45. Which of the following is a key factor in determining the value of perfect information?

a. Decision-maker's intuition
b. Complexity of the decision problem
c. Availability of probabilistic insight
d. Subjectivity of the decision-maker

46. How does the EVPI concept relate to risk management?

a. It helps eliminate all risks in decision-making.
b. It quantifies the potential risk associated with perfect information.
c. It increases risk tolerance.

d. It is not relevant to risk management.

47. What is the significance of a negative EVPI value in a decision problem?
a. It indicates the decision is highly uncertain.
b. It suggests the decision-maker should avoid acquiring additional information.
c. It implies the decision is not important.
d. It is not possible to have a negative EVPI value.

48. In decision analysis, what is the primary purpose of calculating EVPI?
a. To maximize regret
b. To minimize expected value
c. To guide the decision-maker on the value of acquiring more information
d. To ensure perfect information is always obtained

49. Which term is synonymous with the concept of EVPI in decision analysis?
a. Certainty equivalent b. Expected utility
c. Information value d. Risk premium

50. What is the Laplace Criterion used for in decision-making?
a. Minimizing costs
b. Maximizing profits
c. Maximizing expected monetary value

d. Minimizing risks

51. In Laplace Criterion, probabilities are assumed to be:

a. Equally likely b. Unequally likely

c. Ignored d. Fixed

52. Laplace Criterion is suitable for decision-making under:

a. Risk b. Uncertainty

c. Certainty d. Ambiguity

53. What is the formula for Laplace's Expected Monetary Value (EMV)?

a. EMV = Probability * Outcome

b. EMV = Probability * (Outcome - Cost)

c. EMV = Probability * Cost

d. EMV = Outcome / Probability

54. Laplace Criterion is a type of:

a. Maximax b. Maximin

c. Minimax d. Minimax regret

55. In Laplace Criterion, decision alternatives are evaluated based on:

a. Maximum outcome b. Minimum outcome

c. Average outcome d. Range of outcomes

56. If there are three decision alternatives, how many probabilities are needed for Laplace Criterion?

a. One b. Two
c. Three d. It depends

57. Laplace Criterion assumes decision-makers are:
a. Risk-averse b. Risk-neutral
c. Risk-seeking d. Risk-indifferent

58. Laplace Criterion is also known as:
a. Maximum Likelihood
b. Equal Probability Criterion
c. Minimax Regret
d. Expected Value of Perfect Information

59. Laplace's EMV is calculated by:
a. Summing probabilities b. Averaging probabilities
c. Multiplying probabilities d. Dividing probabilities

60.Laplace Criterion is based on the principle of:
a. Optimism b. Pessimism
c. Realism d. Certainty

61. Laplace is most suitable when:
a. Probabilities are known b. Probabilities are not known
c. There is certainty d. There is minimal risk

62. Laplace Criterion is criticized for:
a. Being too complex
b. Ignoring probabilities

c. Assuming unrealistic equal likelihood
d. Maximizing regrets

63. Laplace is a type of:
a. Decision tree
b. Decision matrix
c. Decision rule
d. Decision theory

64. Laplace's EMV is used to:
a. Minimize regrets
b. Maximize expected monetary value
c. Minimize costs
d. Maximize probabilities

65. What does Expected Opportunity Loss (EOL) measure in decision analysis?
a. Profit
b. Regret
c. Revenue
d. Cost

66. In decision theory, which term is often used interchangeably with Expected Opportunity Loss (EOL)?
a. Expected Value
b. Maximum Likelihood
c. Standard Deviation
d. Mean Absolute Error

67. How is Expected Opportunity Loss calculated?
a. EOL = Probability × (Maximum Payoff - Minimum Payoff)
b. EOL = Maximum Payoff - Minimum Payoff
c. EOL = Probability × Maximum Payoff

d. EOL = Probability × Minimum Payoff

68. What is the significance of the Maximum Payoff in EOL?
a. Represents the best-case scenario
b. Represents the worst-case scenario
c. Represents the average outcome
d. Represents the most likely outcome

69. In decision analysis, a decision-maker aims to minimize which of the following to make the best decision?
a. Expected Opportunity Loss b. Maximum Payoff
c. Minimum Payoff d. Expected Value

70. In a decision tree, what does each branch represent?
a. Decision alternatives b. Payoff
c. Probability d. Regret

71. What does the term "regret matrix" refer to in decision analysis?
a. Matrix representing potential profits
b. Matrix representing potential losses
c. Matrix representing opportunity losses
d. Matrix representing decision probabilities

72. When is a decision considered risk-neutral in decision theory?

a. When the decision-maker is risk-averse
b. When the decision-maker is risk-seeking
c. When the decision-maker is risk-neutral
d. When the decision-maker is risk-aware

73. What is the primary goal in decision analysis?
a. Maximizing regret b. Minimizing regret
c. Maximizing profit d. Minimizing cost

74. Which term is used to describe the difference between the actual payoff and the best possible payoff?
a. Maximum Payoff b. Regret
c. Minimum Payoff d. Expected Value

75. In decision theory, what does "minimax regret" strategy involve?
a. Minimizing the maximum regret
b. Maximizing the minimum regret
c. Minimizing the average regret
d. Maximizing the average regret

76. What is the main limitation of using Expected Opportunity Loss (EOL) in decision analysis?
a. Assumes perfect information
b. Ignores probabilities
c. Ignores decision alternatives
d. Assumes risk neutrality

77. Which concept is closely related to Expected Opportunity Loss in decision analysis?

a. Expected Payoff b. Standard Deviation
c. Variance d. Expected Value

78. What role does probability play in the calculation of Expected Opportunity Loss?

a. Probability represents the regret
b. Probability is multiplied by regret
c. Probability is added to regret
d. Probability is subtracted from regret

79. In decision theory, what is the term for the difference between the actual outcome and the expected value?

a. Regret b. Payoff
c. Variance d. Standard Deviation

80. What does EVPI stand for in Operations Research?

a. Effective Variable Prediction Index
b. Expected Value of Perfect Information
c. Efficiency Verification and Performance Indicator
d. Essential Value of Predictive Intelligence

81. In decision analysis, what is the EVPI used to quantify?

a. Cost of decision-making b. Value of uncertainty
c. Benefit of perfect information d. Risk exposure

82. Which of the following is a key factor in calculating EVPI?

a. Probability of perfect information
b. Decision tree height
c. Decision maker's intuition
d. Discount rate

83. How is EVPI related to decision trees in Operations Research?

a. It represents the root node value
b. It is the sum of all terminal node values
c. It is associated with chance nodes
d. It is unrelated to decision trees

84. What does a higher EVPI value indicate?

a. Greater benefit from perfect information
b. Lesser impact of uncertainty
c. Lower decision complexity
d. Minimal need for additional data

85. In EVPI analysis, what role does probability play?

a. Measures decision regret
b. Determines the cost of information
c. Quantifies the likelihood of perfect information
d. Evaluates decision outcomes

86. Which formula represents the calculation of EVPI?

a. EVPI = EMV – EOL b. EVPI = EOL - EMV

c. EVPI = EMV + EOL d. EVPI = EMV * EOL

87. What does EOL stand for in the context of EVPI?
a. Expected Outcome Loss
b. Economic Order Quantity
c. Estimated Opportunity Level
d. Essential Output Log

88. When is EVPI typically used in decision analysis?
a. After decision implementation
b. Before decision-making
c. During risk assessment
d. Only in financial decisions

89. What is the unit of measurement for EVPI?
a. Dollars b. Probability
c. Decision points d. Utility

90. In a decision tree, where is EVPI usually considered?
a. At the decision nodes b. Only at the terminal nodes
c. At chance nodes d. Exclusively at the root node

91. Which factor is NOT considered when calculating EVPI?
a. Decision alternatives
b. Probability of perfect information
c. Time horizon
d. Decision maker's preferences

92. How does the decision maker use EVPI information?
a. To minimize uncertainty
b. To maximize expected value
c. To guide the collection of additional information
d. To ignore uncertainty

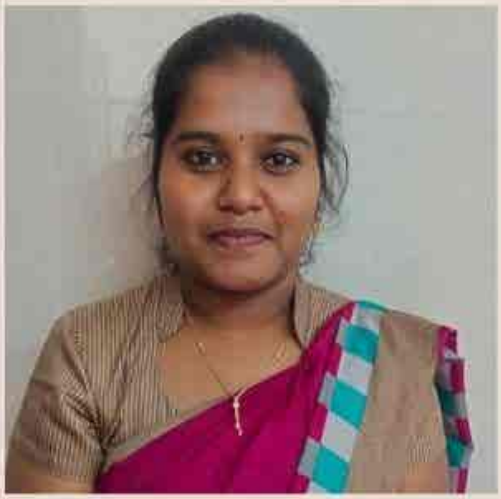
93. What is the relationship between EVPI and decision quality?
a. Inverse correlation b. Direct correlation
c. No correlation d. Random correlation

94. In a scenario with high uncertainty, how would you expect EVPI to compare to a scenario with low uncertainty?
a. EVPI is lower b. EVPI is higher
c. EVPI remains the same d. EVPI is irrelevant

**Answers**

1.b, 2.b, 3.b, 4.b, 5.c, 6.c, 7.b, 8.d, 9.d, 10.b, 11.b, 12.b, 13.b, 14.d, 15.b, 16.b, 17.a, 18.a, 19.b, 20.b, 21.b, 22.b, 23.c, 24.b, 25.a, 26.b, 27.c, 28.b, 29.a, 30.b, 31.c, 32.c, 33.b, 34.b, 35.b, 36.c, 37.c, 38.a, 39.d, 40.b, 41.b, 42.a, 43.a, 44.c, 45.b, 46.b, 47.b, 48.c, 49.c, 50.b, 51.a, 52.a, 53.a, 54.a, 55.c, 56.c, 57.b, 58.b, 59.c, 60.a, 61.b, 62.c, 63.d, 64.b, 65.b, 66.a, 67.a, 68.a, 69.a, 70.a, 71.c, 72.c, 73.b, 74.b, 75.a, 76.a, 77.a, 78.b, 79.a, 80.b, 81.c, 82.a,

83.c, 84.a, 85.c, 86.b, 87.a, 88.b, 89.a, 90.c, 91.c, 92.c, 93.b, 94.b.



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ISBN 978-933402141-7

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