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Barasat, Kolkata- 700125

BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – LLM-2022/LLM-2023/LLM-2024
Course Name – Quantitative Analysis
Course Code - LLM104
(Semester I)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Identify the fundamental characteristic of the transportation problem.
- | | |
|--|--|
| a) It is a single-period linear programming problem | b) It involves finding the shortest path in a network |
| c) It deals with allocating resources from several sources to several destinations | d) It requires the use of quadratic programming techniques |
- (ii) Locate the feasible region in linear programming.
- | | |
|--|---|
| a) It is the region that contains all the points that satisfy the objective function | b) It is the region where the objective function takes on its maximum value |
| c) It is the region that contains all the points that violate the constraints | d) It is the region where the objective function is not defined |
- (iii) Select the correct statement about the transportation problem.
- | | |
|---|---|
| a) The transportation problem always involves only one source and one destination | b) The transportation problem can be solved using only graphical methods |
| c) The transportation problem requires all supplies and demands to be equal | d) The transportation problem deals with finding the optimal way to transport goods at minimum cost |
- (iv) Indicate the purpose of the dual variables in linear programming.
- | | |
|---|---|
| a) They represent the decision variables of the original problem | b) They measure the sensitivity of the objective function coefficients |
| c) They help in identifying the slack or surplus in the constraints | d) They assist in converting a maximization problem into a minimization problem |
- (v) Choose the correct statement regarding the duality theorem in linear programming.
- | | |
|--|---|
| a) The duality theorem only applies to integer linear programming problems | b) The duality theorem states that the dual problem has the same objective function as the primal problem |
|--|---|

- c) The duality theorem establishes a relationship between the optimal solutions of the primal and dual problems
- d) The duality theorem is not relevant when dealing with linear programming problems with more than three variables
- (vi) Locate the condition under which a feasible solution becomes an optimal solution in linear programming.
- a) When it satisfies all the constraints with equality
- b) When it satisfies all the constraints with inequality
- c) When it violates some of the constraints
- d) When it is located outside the feasible region
- (vii) Select the correct statement about the Big M method in linear programming.
- a) The Big M method is used to transform a maximization problem into a minimization problem
- b) The Big M method is employed to find the optimal solution for the dual problem
- c) The Big M method is a graphical technique used to solve transportation problems
- d) The Big M method is used to handle artificial variables and convert an infeasible problem into a feasible one
- (viii) Locate the condition under which the transportation problem becomes infeasible.
- a) When the total supply is less than the total demand
- b) When the total demand is less than the total supply
- c) When the total supply and total demand are equal
- d) When the objective function has multiple optimal solutions
- (ix) Select the correct statement about the optimality condition in linear programming.
- a) The optimality condition requires that all decision variables be positive in the optimal solution
- b) The optimality condition indicates that the objective function must be equal to zero in the optimal solution
- c) The optimality condition states that no other feasible solution can improve the current optimal solution
- d) The optimality condition requires that all constraints be satisfied with strict inequality in the optimal solution
- (x) Indicate the condition under which the dual problem becomes unbounded in linear programming.
- a) When the dual problem has no objective function
- b) When the total supply is less than the total demand in the primal problem
- c) When the objective function of the primal problem is unbounded
- d) When the dual problem has no constraints
- (xi) Select the distribution pattern followed by the PERT analysis.
- a) gamma distribution
- b) normal distribution
- c) beta distribution
- d) log-normal distribution
- (xii) Predict the steps involved in the Project Evaluation and Review Technique (PERT).
- a) Determining the critical path, estimating activity durations, and creating a network diagram
- b) Applying the Critical Path Method (CPM), conducting risk analysis, and identifying project milestones
- c) Analyzing the cost-benefit ratio, assigning resources to activities, and creating a Gantt chart
- d) Conducting risk analysis, estimating activity costs, and determining the project's total duration
- (xiii) Predict the significance of float in network analysis.
- a) It represents the total duration of the project
- b) It indicates the maximum delay each activity can tolerate without delaying the project
- c) It includes all activities that have negative float and are causing delays in the project
- d) It represents the shortest path in the network and indicates the minimum project duration
- (xiv) Select the correct statement from the followings in connection with PERT diagram.

- a) It represents the shortest path in the network and indicates the minimum project duration
 - b) It includes all activities that have positive float and can be delayed without affecting the project completion time
 - c) It consists of all activities that have negative float and are causing delays in the project
 - d) It represents the path with zero float and any delay in activities on this path will delay the project
- (xv) Predict the name of the game if there is no saddle point.
- a) Deterministic game
 - b) Fair game
 - c) Mixed strategy game
 - d) Multiplayer game

Group-B

(Short Answer Type Questions)

3 x 5=15

- 2. Discuss the sensitivity analysis. (3)
- 3. Describe the concept of degeneracy in LPP. (3)
- 4. Describe duality theory in LPP. (3)
- 5. Explain the drawbacks of game theory application (3)
- 6. Illustrate the interpretation of dual variables in the context of linear programming. (3)

OR

Illustrate the economic interpretation of shadow prices in the dual problem of linear programming. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

- 7. Describe the basic components of a linear programming problem. (5)
- 8. Discuss the concept of degeneracy in linear programming. (5)
- 9. Illustrate differences between the balanced assignment problem and the unbalanced assignment problem. (5)
- 10. Access one real-life use of game theory. (5)
- 11. Explain the concept of zero-sum game. (5)
- 12. Explain the concept of dummy sources and dummy destinations in transportation problems. (5)

OR

Explain transportation problem as a minimization model.. (5)
