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BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – BBA-Hons-2023/BBA-Hons-2024/BBA(BA)-Hons-2024

Course Name – Operations Research

Course Code - BBA40202/BBA40109/BBB40106

(Semester IV)

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) Define Duality in Linear Programming.

- | | |
|---|---|
| a) The existence of two solutions | b) A method to solve probability problems |
| c) A concept where every LPP has an associated dual problem | d) A situation where no solution exists |

(ii) Match the following: Degeneracy occurs when...

- | | |
|---|--------------------------------|
| a) An optimal solution is unbounded | b) Two or more solutions exist |
| c) A basic variable has a zero value in the simplex table | d) No feasible solution exists |

(iii) Recognize an advantage of the Simplex Method.

- | | |
|--|---|
| a) Works for all optimization problems | b) Finds an optimal solution for LPP systematically |
| c) Requires no constraints | d) Only works for integer programming |

(iv) Match the following: Infeasibility in LPP means...

- | | |
|--|---------------------------------------|
| a) No solution satisfies all constraints | b) There are multiple solutions |
| c) There is an unbounded solution | d) The solution process is incomplete |

(v) Identify the first step in the North-West Corner Rule.

- | | |
|---------------------------------|---|
| a) Select the largest cost cell | b) Allocate to the top-left corner cell |
| c) Choose the least cost cell | d) Distribute supply evenly |

(vi) Identify which method considers opportunity cost for optimality.

- | | |
|---------------------------|---------------------|
| a) Least Cost Method | b) MODI Method |
| c) North-West Corner Rule | d) Hungarian Method |

(vii) Identify the main assumption in transportation models.

- | | |
|-------------------------------------|-------------------------------------|
| a) Equal cost for all routes | b) Total supply equals total demand |
| c) Only one optimal solution exists | d) Assignments are fixed |

- (viii) Identify the key difference between the Least Cost Method and Vogel's Approximation Method.
- | | |
|------------------------------------|--|
| a) LCM considers cost differences | b) LCM directly provides an optimal solution |
| c) LCM does not consider penalties | d) VAM ignores penalties |
- (ix) Write the formula for calculating slack time in project scheduling.
- | | |
|------------------------------|------------------------------|
| a) Late start - Early start | b) Early start - Late start |
| c) Late finish - Early start | d) Early finish - Late start |
- (x) Write the objective of crashing a project schedule.
- | | |
|---|----------------------------------|
| a) Minimize total project cost | b) Increase resource utilization |
| c) Reduce project duration at minimum additional cost | d) Maximize slack time |
- (xi) Choose the best method for reducing project duration while minimizing cost.
- | | |
|-------------|-----------------------|
| a) Crashing | b) Resource levelling |
| c) PERT | d) OBS |
- (xii) Identify the key factor affecting decision making under uncertainty.
- | | |
|---------------------------------------|--------------------------------------|
| a) Perfect knowledge of future events | b) Subjective probability estimation |
| c) Availability of past data | d) Standardized decision rules |
- (xiii) Choose the correct method to handle uncertainty in project scheduling.
- | | |
|---------|--------|
| a) PERT | b) CPM |
| c) CBS | d) OBS |
- (xiv) Indicate which decision phase involves evaluating different alternatives.
- | | |
|-----------------------|-------------------|
| a) Problem definition | b) Analysis |
| c) Choice | d) Implementation |
- (xv) Write the formula for total project cost given normal and crash costs.
- | | |
|-----------------------------|-----------------------------|
| a) Normal cost + Crash cost | b) Normal cost - Crash cost |
| c) Crash cost * Normal cost | d) Crash cost / Normal cost |

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Question:

(3)

Draw the feasible region for the following constraints and shade it:

Constraints:

$$x_1 + x_2 \leq 20$$

$$x_1 + x_2 \leq 30$$

$$x_1 \geq 0, x_2 \geq 0$$

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3. Consider the linear programming problem with the objective function:

(3)

$$\text{Maximize } Z = 4x_1 + x_2$$

The feasible region is defined by the corner points:

(0,0)

(30,0)

(20,30)

(0,50)

Determine the point at which the value of Z is maximized and calculate the corresponding optimal value of Z.

4. Summarize how the Graphical Method and the Simplex Method are used to solve Linear Programming Problems (LPP). Highlight their main features and explain why the Simplex Method is necessary for higher-dimensional problems. (3)
5. List any three uses of Operations Research in real life. (3)
6. Consider the following payoff matrix for Player A: (3)

A \ B	B1	B2
A1	3	2
A2	1	4

Determine whether the game has a **saddle point**.

OR

Analyze and compare the **North-West Corner Rule** and **Vogel's Approximation Method (VAM)** in terms of initial solution quality and transportation cost. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. **Q. Find the feasible solution for the given transportation problem using the North-West Corner Method.** (5)

	W1	W2	W3	W4	Supply
F1	14	25	45	5	6
F2	16	25	35	55	8
F3	35	3	65	15	16
Demand	4	7	6	13	

8. Evaluate the effectiveness of a Work Breakdown Structure (WBS) in organizing and managing complex real-world projects. (5)
9. Justify the importance of decision analysis in business operations by evaluating its role in improving decision-making. Explain how tools like the Payoff Table and Opportunity Loss Table contribute to making better business decisions by minimizing risks and optimizing outcomes. (5)
10. Discuss the role of players, strategies, payoffs, and outcomes in Game Theory. How do these elements interact to influence decision-making? (5)

11. Enumerate the dual from the primal. (5)

$$\text{Minimize } Z = 3x_1 + 5x_2 + 7x_3$$

subject to the constraints:

$$x_1 + x_2 + 3x_3 \leq 10$$

$$4x_1 - x_2 + 2x_3 \geq 15$$

$$x_1, x_2, x_3 \geq 0$$

12. Analyze the importance of constraints in determining the feasibility and optimality of a Linear Programming Problem (LPP). (5)

OR

Based on the solution of a Linear Programming Problem (LPP), conclude what an optimal solution represents and explain its significance in decision-making. (5)

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