

R18

Code No: 156DY

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, August/September - 2024

QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS

(Common to CE, EEE)

Time: 3 Hours

Max. Marks: 75

- Note:** i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

- 1.a) Define Operations Research. [2]
b) Why is it important to analyze and define the problem carefully in Operations Research? [3]
c) Outline two common approaches used to solve the Traveling Salesman Problem. [2]
d) What is the Traveling Salesman Problem? [3]
e) Explain the concept of lifecycle considerations in replacement models. [2]
f) List the three factors that influence decisions in replacement models. [3]
g) Explain what a saddle point is in the context of Game Theory. [2]
h) Discuss the rules of dominance in Game Theory. [3]
i) Discuss the role of random numbers in simulation experiments. [2]
j) Explain how simulation can be applied to optimize inventory management. [3]

PART – B

(50 Marks)

- 2.a) Explain the basic steps of the Simplex method for solving Linear Programming problems.
b) Compare and contrast the types of models used in Operations Research. [5+5]

OR

- 3.a) Compare the advantages and disadvantages of the graphical method and the Simplex method in solving Linear Programming problems.
b) Evaluate the effectiveness of the Duality Principle in optimizing solutions to Linear Programming problems. [5+5]

- 4.a) Explain the Hungarian Method for solving the Assignment Problem. What are its advantages and limitations compared to other methods?
b) Define the Assignment Model and its characteristics. How does it differ from other types of linear programming models? [5+5]

OR

5. A company has three warehouses (W1, W2, W3) and four retail outlets (R1, R2, R3, R4). The supply capacities at the warehouses and the demand requirements at the retail outlets are as follows:

Warehouse capacities (supply):

W1: 100 units

W2: 150 units

W3: 200 units

Retail outlet demands:

R1: 70 units

R2: 80 units

R3: 90 units

R4: 110 units

The transportation costs (in dollars per unit) from each warehouse to each retail outlet are given in the table below:

	R1	R2	R3	R4
W1	4	6	8	10
W2	5	7	6	9
W3	8	3	7	4

Formulate this problem as a transportation problem and find the optimal transportation plan that minimizes total transportation costs. [10]

- 6.a) Discuss the challenges associated with implementing a group replacement strategy for low-cost items.
- b) What factors need to be considered to ensure the strategy's effectiveness and efficiency? [5+5]

OR

7. A manufacturing plant has 50 identical machines, each costing \$10,000 when new. The machines have a useful life of 5 years and no salvage value at the end of their useful life. The plant management is considering a group replacement strategy where all 50 machines will be replaced simultaneously after 5 years. The annual maintenance cost per machine is \$2,000, and the discount rate is 12%. Calculate the total present worth of costs associated with maintaining and replacing the machines under the group replacement strategy. Compare this with the total present worth of costs if the machines were replaced individually as they fail (assuming no change in maintenance costs). [10]

8. How do these rules help simplify decision-making processes and identify optimal strategies? [10]

OR

9. Consider the following payoff matrix for a game between Player A and Player B: Apply the rule of dominance to simplify the game. Determine if any strategies can be eliminated due to dominance. [10]

	L	M	R
U	(3, 2)	(1, 5)	(4, 3)
C	(2, 4)	(3, 1)	(2, 2)
D	(0, 1)	(2, 3)	(1, 0)

10. Describe queuing models with a First-Come-First-Served (FCFS) queue discipline, including:
- Single service station with infinite population.
 - Single service station with finite population.
 - Multi-service station models with infinite population.
- [10]

OR

11. A bank operates with a single teller. Customers arrive according to a Poisson process at a rate of 10 customers per hour. The bank has a fixed number of 20 customers waiting in line before it closes.
- a) Determine the average number of customers in the system and the average time spent in the system.
- b) Calculate the probability that a customer arriving finds all tellers busy and has to wait.
- [5+5]

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