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Total No. of Questions : 09

Total No. of Pages : 03

**B.Com. (Hons.) (Sem.–6)**

**OPERATION RESEARCH**

**Subject Code : BCOM-602-18**

**M.Code : 79471**

**Date of Examination : 06-07-22**

**Time : 3 Hrs.** **Max. Marks : 60**

**INSTRUCTIONS TO CANDIDATES :**

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTIONS-B consists of FOUR Sub-sections : Units-I, II, III & IV.**
3. **Each Sub-section contains TWO questions each, carrying TEN marks each.**
4. **Student has to attempt any ONE question from each Sub-section.**

## SECTION-A

1. **Write briefly :**

   a) Arrival Rate

   b) Saddle Point.

   c) Decision Tree

   d) Scope of Operations Research.

   e) Principle of Dominance.

   f) Hungarian Method.

   g) Game Theory.

   h) Degeneracy in Transportation.

   i) Reorder Level.

   j) Limitations of Dominance method in game theory.





## SECTION-B

### UNIT-I

2. Define Operations Research. Discuss the scope and limitations of Operations Research.

3. Ajay Foods Ltd. has 4 sales representatives who are to be assigned different regions. The monthly sales expected from each of the sale representative (in lakhs) in different sales region is given below:

| Sales Representatives | Sales Region | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| P | 200 | 150 | 170 | 220 |
| Q | 160 | 120 | 150 | 140 |
| R | 190 | 195 | 190 | 200 |
| S | 180 | 175 | 160 | 190 |

Suggest optimal assignment and the total maximum sales increase per month.

### UNIT-II

4. Solve the following game theory problem:

| | | Player Y | | |
|---|---|---|---|---|
| | | $Y_1$ | $Y_2$ | $Y_3$ |
| Player X | $X_1$ | 3 | –2 | 4 |
| | $X_2$ | –1 | 4 | 2 |
| | $X_3$ | 2 | 2 | 6 |

5. What is dynamic programming? Write step by step procedure to solve a general problem by D.P approach.

### UNIT-III

6. Discuss the arrival and service processes of waiting line models. Write the standard method of expressing the queuing problem.

7. Discuss the concept of network analysis. Explain the PERT & CPM models and their utility.

## UNIT-IV

8. What is meant by Economic Ordered Quantity? Discuss its utility in Inventory Control.

9. a) What are the various costs that one should take into consideration while suggesting a replacement policy?

   b) A fleet owner finds from his past records that the cost per year of an auto whose purchase price is Rs 60,000 is as given below:

| Year | Running Cost (Rs.) | Resale Value (Rs.) |
|---|---|---|
| 1 | 10,000 | 30,000 |
| 2 | 12,000 | 15,000 |
| 3 | 14,000 | 7,500 |
| 4 | 18,000 | 3,750 |
| 5 | 23,000 | 2,000 |
| 6 | 28,000 | 2,000 |
| 7 | 34,000 | 2,000 |
| 8 | 40,000 | 2,000 |

Assuming the rate of return to be 8%, determine at what age is its replacement due.

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Total No. of Pages : 04

Total No. of Questions : 09

B.Com (Hons.) (Sem.–6)

# OPERATION RESEARCH

Subject Code : BCOM602/18

M.Code : 79471

Date of Examination: 29-04-2024

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

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4. **Student has to attempt any ONE question from each Sub-section.**

## SECTION-A

**1. Attempt all questions :**

a) Write basic structure of Linear Programming Problem.

b) Discuss in brief about inventory models.

c) Discuss Hungrarian Method in Assignment Problem.

d) Define saddle point in game theory.

e) What are the general similarities between dynamic programming and linear programming?

f) Explain the various quantitative methods that are useful for decision-making under uncertainty.

g) Discuss use of Transportation problem.

h) Minimize $x-2y$ subject to: $-2x+y \leq 8$ and $-x+2y \leq -24$, $x, y \geq 0$.

i) What is traffic intensity in queuing theory?

j) Solve the following games :

| | Player B | | | |
|---|---|---|---|---|
| **Player A** | $B_1$ | $B_2$ | $B_3$ | $B_3$ |
| $A_1$ | 1 | 7 | 3 | 4 |
| $A_2$ | 5 | 6 | 4 | 5 |
| $A_3$ | 7 | 2 | 0 | 3 |

## SECTION-B

## UNIT-I

2. Wheat is harvested and stored is grain elevators in 3 different cities (C1, C2 and C3). These grain elevators supply three flour mills located in A, B and C. Grain is shipped to mills in railroad cars, each of capable of holding one ton of wheat. The cost of transportation one ton of wheat from each grain elevator to each mill are given below :

| **Miles** | **A** | **B** | **C** | **Supply** |
|---|---|---|---|---|
| **City C1** | 6 | 8 | 10s | 150 |
| **City C2** | 7 | 11 | 11 | 175 |
| **City C3** | 4 | 5 | 12 | 275 |
| **Demand** | 200 | 100 | 300 | 600 |

Using MODI method, find how many tons of wheat to be transported from each grain elevator to each mill on a monthly basis in order to minimize the total cost of transportation.

3. Ralph Edmund loves steaks and potatoes. Therefore, he has decided to go on a steady diet of only these two foods (plus some liquids and vitamin supplements) for all his meals. Ralph realizes that this isn't the healthiest diet, so he wants to make sure that he eats the right quantities of the two foods to satisfy some key nutritional requirements. He has obtained the following nutritional and cost information:

| **Ingredients** | **Grams of Ingredient per Serving** | | **Daily Requirement (Grams).** |
|---|---|---|---|
| | Steak | Potatoes | |
| Carbohydrates | 5 | 15 | $\geq 50$ |
| Protein | 20 | 5 | $\geq 40$ |
| Fat | 15 | 2 | $\leq 60$ |
| Cost per serving | \$4 | \$2 | |

Ralph wishes to determine the number of daily servings (may be fractional) of steak and potatoes that will meet these requirements at a minimum cost. Help Ralph to reach at optimal decision.

## UNIT-II

4. Assume that two firms are competing for the market share for a particular product. Each firm is considering what promotional strategy to employ for the coming period. Assume that the following payoff matrix describes the increase in market share of Firm A and the decrease in market share for Firm B. Determine the optimal strategies for each firm

| **Firm A** | **Firm B** | | |
|---|---|---|---|
| | No Promotion | Moderate Promotion | Much Promotion |
| No Promotion | 5 | 0 | -10 |
| Moderate Promotion | 10 | 6 | 2 |
| Much Promotion | 20 | 15 | 10 |

Which firm would be the winner, in terms of market share?

5. In a toy manufacturing company, suppose the product acceptance probabilities are not known but the following data is known :

| **Product Acceptance** | **Anticipated First Year Profit ('000 Rs) Product Line** | | |
|---|---|---|---|
| | Full | Partial | Minimal |
| Good | 8 | 70 | 50 |
| Fair | 50 | 45 | 40 |
| Poor | -25 | -10 | 0 |

Determine the optimal decision under each of the following decision criteria and show how you arrived at it :

a) Maximax, b) Maximin, c) Laplace and d) Hurwicz Criteria ($\alpha$=0.63)?

## UNIT-III

6. You are given the following information about a project consisting of six activities:

| Activity | Immediate Predecessors | Estimated Duration (Months) |
|---|---|---|
| A | – | 5 |
| B | – | 1 |
| C | B | 2 |
| D | A, C | 4 |
| E | A | 6 |
| F | D, E | 3 |

a) Construct the project network for this project.

b) Find the earliest times latest times, and slack for each activity. Which of the paths is a critical path?

c) If all other activities take the estimated amount of time. What is the maximum duration of activity D without delaying the completion of the project?

7. Speedy Oil provides a single-channel automobile oil change and lubrication service. Customers provide an arrival rate of 4 cars per hour. The service rate is 8 cars per hour. Assume arrivals follow Poisson probability distribution and that service times follow an exponential probability distribution.

a) What is the average number of cars in the system?

b) What is the average time that a car waits for the oil and lubrication service to begin?

c) What is the average time a car spends in the system?

## UNIT-IV

8. a) Machine A costs Rs 9,000. Its annual operating costs are Rs 200 for the first year, and then increase by Rs 2,000 every year. Determine the best age at which the machine should be replaced. If the optimum replacement policy is followed, what will be the average yearly cost of owning and operating the machine?

b) Machine B costs Rs 10,000. Its annual operating costs are Rs 400 for the first year, and then increase by Rs 800 every year. You now have a machine of type A that is one year old. Should you replace it with B, if so, when?

9. Suppose that the demand for a product is 30 units per month and the items are withdrawn at a constant rate. The setup cost each time a production run is undertaken to replenish inventory is Rs.15. The production cost is Re.1 per item, and the inventory-holding cost is Rs. 0.30 per item per month.

a) Assuming shortages are not allowed, determine how often to make a production run and what size it should be?

b) If shortages are allowed but cost Rs. 3 per item per month, determine how often to make a production run and what size it should be.

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Total No. of Questions : 09

B.Com (Honours) (Sem.–6)

# OPERATION RESEARCH

Subject Code : BCOM602-18

M.Code : 79471

Date of Examination: 02-01-2025

Time : 3 Hrs. Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

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## SECTION-A

1. **Attempt all questions :**

a) Inventory Control

b) Big M method

c) Assumptions of LLP

d) Saddle Point

e) What is Duality?

f) Slack and Float

g) Functions of inventory management

h) Dummy Activity

i) Degeneracy in Transportation

j) Queuing Theory



## SECTION-B

### UNIT-I

2. What do you mean by Operation Research? Discuss its scope as well as limitations.

3. Solve the following LLP:

Max $Z = 2X_1 + 4X_2$

Sub to $2X_1 + X_2 \leq 18$

$3X_1 + 2X_2 \geq 30$

$X_1 + 2X_2 = 26$

Whereas $X_1, X_2 \geq 0$

### UNIT-II

4. Solve the following Game theory problem:

| | | Player B | | |
|---|---|---|---|---|
| | | $B_1$ | $B_2$ | $B_3$ |
| Player A | $A_1$ | 3 | -2 | 4 |
| | $A_2$ | -1 | 4 | 2 |
| | $A_3$ | 2 | 2 | 6 |

5. What is Decision tree analysis? How does decision analysis helps the decision maker?

### UNIT-III

6. Discuss the concept of Network Analysis. Explain the PERT & CPM models and their utility.

7. What is queuing theory? In what types of problem situations can it be applied successfully? Discuss giving examples.

### UNIT- IV

8. Critically discuss the various types of inventory models.

9. What is replacement policy? What are the various types of replacement polices?

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