



Operations Research

Sheet 5



What is Operations Research?

Operations:

- The activities carried out in an organization.

Research:

- The process of observation and testing characterized by the scientific method.

Operations Research:

- Is a quantitative approach to decision making based on the scientific method of problem solving.



What is Operations Research?

Operations Research:

is the scientific approach to execute decision making, which consists of:

- The art of mathematical modeling of complex situations.
- The science of the development of solution techniques used to solve these models.
- The ability to effectively communicate the results to the decision maker.



Problem Solving and Decision Making

7 Steps of Problem Solving (First 5 steps are the process of decision making)

- Identify and define the problem.
- Determine the set of alternative solutions.
- Determine the criteria for evaluating the alternatives.
- Evaluate the alternatives.
- Choose an alternative.

- Implement the chosen alternative.
- Evaluate the results.



MCQ

- is a method of mathematically based analysis for providing a quantitative basis for management decisions.
 - 1- System
 - 2- Operations research
 - 3- None of the above



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- 2- Operations
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MCQ

- Assume all data are known with certainty is
- 1- Deterministic models
- 2- Stochastic models
- 3- None of the above



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- explicitly represent uncertain data via random variables or stochastic processes is
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MCQ

- explicitly represent uncertain data via random variables or stochastic processes is
- 1- Deterministic models
- 2- **Stochastic models**
- 3- None of the above



MCQ

- Potential Reasons for a Quantitative Analysis Approach to Decision Making is
- 1- The problem is complex
- 2- The problem is very important
- 3- The problem is new
- 4- The problem is repetitive
- 5- All of the above



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MCQ

- What is the importance (Goal) of using operations research
- 1- Make a good decision
- 2- Solve a problem
- 3- Use less resources
- 4- All of the above



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T & F

► Linear Programming is deterministic model.

1- True

2- False



T & F

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T & F

► Identify and define the problem is one of Decision Making steps.

1- True

2- False



T & F

- Identify and define the problem is one of Decision Making steps.

1- True

2- False



T & F

- Identify and define the problem is the last step of Decision Making steps.
 - 1- True
 - 2- False



T & F

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 - 2- False



T & F

➤ Evaluate the results is one of Decision Making steps.

1- True

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T & F


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Operations Research Steps

- 
- **Problem Solving Process.**
 - **The Situation**
 - **Problem Formulation**
 - **Data Preparation**
 - **Constructing a Model**
 - **Model Development**
 - **Advantages of Models**
 - **Mathematical Models**
 - **Transforming Model Inputs into Output**



MCQ

- Internal nursing staff not happy with their schedules hospital using too many external nurses is example for
- 1- Goal
- 2- The Situation
- 3- Problem Formulation
- 4- Data Preparation



MCQ

- Internal nursing staff not happy with their schedules hospital using too many external nurses is example for
- 1- Goal
- 2- **The Situation**
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- 4- Data Preparation



MCQ

- Maximize individual nurse preferences subject to demand requirements is example for
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- 2- The Situation
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MCQ

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MCQ

- Define relationships between individual nurse assignments and preference violations; define tradeoffs between the use of internal and external nursing resources. is example for

1- The Situation

2- Problem Formulation

3- Data Preparation

4- Constructing a Model



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MCQ

- ▶ Are representations of real objects or situations.....
 - 1- Design
 - 2- Painting
 - 3- Models
 - 4- None of the above



MCQ

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 - 4- None of the above

Example 1

An oil company owns two refineries- refinery A and refinery B. Refinery A is capable of producing 20 barrels of petrol and 25 barrels of diesel per day. Refinery B is capable of producing 40 barrels of petrol and 20 barrels of diesel per day. The company requires at least 1000 barrels of petrol and at least 800 barrels of diesel. If it costs Rs. 300 per day to operate refinery A and Rs. 500 per day to operate refinery B,

- how many days should each refinery be operated by the company so as to minimize costs?
- **Formulate this problem as a linear programming model.**



Solution

► Minimize $Z = 300x_1 + 500x_2$

► subject to :

$$20x_1 + 40x_2 \geq 1000$$

$$25x_1 + 20x_2 \geq 800$$

$$x_1, x_2 \geq 0$$

Example 2

The Diet Problem: A nutritionist is planning a menu consisting of two main foods A and B.

Each ounce of A contains 2 units of fat, 1 unit of carbohydrates, and 4 units of protein.

Each ounce of B contains 3 units of fat, 3 unit of carbohydrates, and 3 units of protein.

The nutritionist wants the meal to provide at least 18 units of fat, 12 unit of carbohydrates, and 24 units of protein.

- If an ounce of A costs 20 cents and an one of B costs 25 cents, how many ounce of each food should be served to minimize the cost of the meal yet satisfy the nutritionist's requirements?



Solution

Objective:

$$\min Z = 20x_1 + 25x_2$$

Sub to:

$$2x_1 + 3x_2 \geq 18$$

$$x_1 + 3x_2 \geq 12$$

$$4x_1 + 3x_2 \geq 24$$

Questions



Thank You!