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| **SESSION** | **FEBRUARY - MARCH 2024** |
| **PROGRAM** | **MASTER OF BUSINESS ADMINISTRATION (MBA)** |
| **SEMESTER** | **II** |
| **COURSE CODE & NAME** | **DMBA205-OPERATIONS RESEARCH** |
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|  |  |

**Assignment Set – 1**

**1. What is Operations Research? Explain the Methodology used to solveOperationsResearch Problems in brief.**

**Ans 1.**

**Operations Research**

Operations Research (OR) is a discipline that utilizes mathematical models, statistical analysis, and optimization techniques to aid in decision-making and problem-solving. It involves applying scientific methods to complex problems in order to help organizations make better decisions and improve their operations. OR is used in various industries and sectors, including manufacturing, logistics, finance, healthcare, and telecommunications, among others.

**Methodology Used to Solve Operations Research Problems**

**Problem Formulation** The first step in solving an Operations Research problem is to clearly

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**2. Solve the following linear programming problem using its Dual form:**

 **Minimize Z = 3x1 + 4x2**

**Subject to: 4x1 + x2 ≥ 30**

 **-x1 - x2 ≤ -18**

 **x1 +3x2 ≥ 28**

**where x1, x2 ≥ 0**

Ans 2.

The dual form of this primal problem is:

Maximize $W=30y1-18y2+28y3$

Subject to:

$$4y1-y2+y\leq 3$$

$$y1+3y\geq 24$$

$$y1,y2,y3\geq 0$$

**3. A firm marketing a product has four salesman S1, S2, S3 and S4. There are three customers to whom a sale of each unit to be made. The chance of making a sale to a customer depend on the salesman customer support. The data depicts the probability with which each of the salesman can sell to each of the customers.**

|  |  |
| --- | --- |
|  | **Salesman** |
| **Customer** | **S1** | **S2** | **S3** | **S4** |
| **C1** | **0.7** | **0.4** | **0.5** | **0.8** |
| **C2** | **0.5** | **0.8** | **0.6** | **0.7** |
| **C3** | **0.3** | **0.9** | **0.6** | **0.2** |

**If only one salesman is to be assigned to each of the customers, what combination of salesman and customers shall be optimal. Give further that the profit obtained by selling one unit of C1 is Rs. 500, whereas it is respectively Rs 450 and Rs. 540 for sale to C2 and C3. What is the expected profit?**

**Ans 3a.**

Multiply each customers profit value with the probability of each salesman and customer

|  |  |
| --- | --- |
| Customer | Salesmen |
|  | S1 | S2 | S3 | S4 |
| C1 | 0.7\*500 | 0.4\*500 | 0.5\*500 | 0.8\*500 |
| C2 | 0.5\*450 | 0.8\*450 | 0.6\*450 | 0.7\*450 |
| C3 | 0.3\*540 | 0.9\*540 | 0.6\*540 | 0.2\*540 |

**Assignment Set – 2**

**1. What is Monte Carlo simulation? Explain Monte Carlo Simulation Procedure in brief.**

**Ans 1.**

**Monte Carlo Simulation: A Powerful Tool for Decision Making**

Monte Carlo simulation is a computational technique used to assess the impact of risk and uncertainty in decision-making processes. Named after the famous Monte Carlo Casino in Monaco, known for its games of chance, this method involves using random sampling and probability distributions to model different possible outcomes in a problem. It provides a range of possible outcomes and the probabilities they will occur for any choice of action,

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**2. Asmallprojectiscomposedofsevenactivities,whosetimeestimatesarelistedin the table below:**

|  |  |
| --- | --- |
| **Activity (i – j)** | **Estimated Duration (Weeks)** |
| **Optimistic** | **Most Likely** | **Pessimistic** |
| **1 – 2** | **1** | **1** | **7** |
| **1 – 3** | **1** | **4** | **7** |
| **1 – 4** | **2** | **2** | **8** |
| **2 – 5** | **1** | **1** | **1** |
| **3 – 5** | **2** | **5** | **14** |
| **4 – 6** | **2** | **5** | **8** |
| **5 – 6** | **3** | **6** | **15** |

**Draw the network diagram of activities in the project.**

**Find the expected duration and variance for each activity. What is the expected project length?**

**Calculate the variance and standard deviation of the project length. What is the probability that the project will be completed atleast 4 weeks earlier than expected time.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Z** | **0.67** | **1.00** | **1.33** | **2.00** |
| **Prob.** | **0.2514** | **0.1587** | **0.0918** | **0.0228** |

**Ans 2.**

Making use of time estimates $t\_{0},t\_{m}$ and $t\_{p}$, the calculations for expected time $t\_{e}$ and variance $σ^{2}$ for activities are shown in table below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ActivitySequence | Time Duration (Weeks) | $$t\_{o}+4t\_{m}+t\_{p}$$ | $$σ^{2}=\left(\frac{t\_{p}-t\_{o}}{6}\right)^{2}$$ |  |
| $$t\_{o}$$ | $$t\_{m}$$ |  |
| $$1-2$$ | 1 | 1 | 7 | 2 | 1 |
| $$1-3$$ | 1 | 4 | 7 | 4 | 1 |

**3. There is a game between the two players A and B where A is maximizing player and B is minimizing player. Player A wins B’s coin if the two coins total are equal to odd number and losses his coin if total to two coins is even. It is game of 1, 2, 5, 10 and 50 rupees coins. Determine the payoff matrix, the optimal strategies for each player and the value of the game to A.**

**Ans 3.**

To solve this, let's first construct the payoff matrix:

Let's represent the coins as 1, 2, 5, 10, and 50 rupees, respectively. Player A is the maximizing player and Player B is the minimizing player. The possible totals can be odd (win for A) or even (loss for A). The matrix will have rows for Player A's choices and columns for Player B's choices, and the entries will represent the payoff to A.