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| **SESSION** | **NOV 2024** |
| **PROGRAM** | **Master of CoMPUTER APPLICATIONS (MCA)** |
| **SEMESTER** | **I** |
| **course CODE & NAME** | **DCA6108 DISCRETE mATHEMATICS & GRAPH THEORY** |
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**Set-I**

### **1. Express the System of Equations in Matrix Form and Solve Using the Elimination Method**

The system of equations given is:

1. $2x\_{1}+x\_{2}+2x\_{3}+x\_{4}=6$
2. $6x\_{1}-6x\_{2}+6x\_{3}+12x\_{4}=36$
3. $4x\_{1}+4x\_{2}+3x\_{3}-3x\_{4}=-1$
4. $2x\_{1}+2x\_{2}-x\_{3}+x\_{4}=10$

**Ans 1.**

We represent this system in matrix form as $AX=B$, where:

$$A=\left[\begin{matrix}2&1&2&1\\6&-6&6&12\\4&4&3&-3\\2&2&-1&1\end{matrix}\right], X=\left[\begin{matrix}x\_{1}\\x\_{2}\\x\_{3}\\x\_{4}\end{matrix}\right], B=\left[\begin{matrix}6\\36\\-1\\10\end{matrix}\right].$$

To solve using the elimination method:

1. **Step 1: Eliminate** $x\_{1}$ **from all equations except the first.**Divide Row 1 (R1) by 2 to make the pivot element 1. Then subtract appropriate multiples of R1 from the other rows. This results in the updated matrix:

Its Half solved only

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**2. Two APs have the same common difference. The difference between their 100th terms is 100,**

**what is the difference between their 1000th terms?**

### **Ans 2.**

### **Difference Between 1000th Terms of Two APs**

We are given that two arithmetic progressions (APs) have the same common difference ($d$). The difference between their 100th terms is 100. We need to find the difference between their 1000th terms.

#### General Form of AP:

Let the first AP be:
$a\_{1},a\_{1}+d,a\_{1}+2d,…$.

Let the second AP be:
$b\_{1},b\_{1}+d,b\_{1}+2d,…$.

**3. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find:**

1. **The number of people who read at least one of the newspapers.**
2. **The number of people who read exactly one of the newspapers.**

### **Ans 3.**

### **3. Newspaper Survey Problem**

#### **Given Data:**

* Total people surveyed ($U$): 60
* $n\left(H\right)=25$, $n\left(T\right)=26$, $n\left(I\right)=26$
* $n\left(H∩I\right)=9$, $n\left(H∩T\right)=11$, $n\left(T∩I\right)=8$, $n\left(H∩T∩I\right)=3$

We use the principle of inclusion-exclusion to answer both parts.

#### **(a) Number of people who read at least one newspaper:**

Using the formula for the union of three sets:

$$n\left(H∪T∪I\right)=n\left(H\right)+n\left(T\right)+n\left(I\right)-n\left(H∩T\right)-n\left(H∩I\right)-n\left(T∩I\right)+n\left(H∩T∩I\right)$$

### **4. Logical Proof:** $\left.p\rightarrow \left(q\rightarrow r\right)=\left(p∧q\right)\rightarrow r\right.$

#### **Ans 4.**

#### **Proof:**

We prove the equivalence using truth tables and logical equivalences.

##### **Step 1: Recall definitions of logical operators**

1. Implication: $\left.p\rightarrow q=¬p∨q\right.$
2. Conjunction: $p∧q$ is true only if both $p$ and $q$ are true.

##### **Step 2: Expand** $\left.p\rightarrow \left(q\rightarrow r\right)\right.$**:**

Using the definition of implication:

$$\left.p\rightarrow \left(q\rightarrow r\right)=¬p∨\left(q\rightarrow r\right)\right.$$

Substitute $\left.q\rightarrow r=¬q∨r\right.$:

$$\left.p\rightarrow \left(q\rightarrow r\right)=¬p∨\left(¬q∨r\right)\right.$$

**5. In a retail market, fruit vendors were selling mangoes kept in packing boxes. These boxes contained varying numbers of mangoes. The following was the distribution of mangoes according to the number of boxes:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of mangoes** | **50 – 52** | **53 - 55** | **56 – 58** | **59 - 61** | **62 – 64** |
| **Number of boxes**  | **15** | **110** | **135** | **115** | **25** |

**Ans 5.**

Find the mean number of mangoes kept in a packing box.

### **5. Mean Number of Mangoes in a Packing Box**

#### **Given Data:**

The data represents the number of mangoes in packing boxes and their corresponding frequencies:

| Number of Mangoes (Class Interval) | Midpoint ($x\_{i}$) | Number of Boxes ($f\_{i}$) |
| --- | --- | --- |
| 50 – 52 | 51 | 15 |
| 53 – 55 | 54 | 110 |
| 56 – 58 | 57 | 135 |
| 59 – 61 | 60 | 115 |
| 62 – 64 | 63 | 25 |

#### **Step 1: Formula for Mean**

The mean is calculated using the formula:

$$Mean\left(\overset{ˉ}{x}\right)=\frac{∑f\_{i}x\_{i}}{∑f\_{i}}$$

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**6. Explain about walk, Path & Circuit and also define Regular & complete connected graphs.**

### **Ans 6.**

### **Walk, Path, Circuit, Regular & Complete Connected Graphs**

#### **Walk**

A **walk** in a graph is a sequence of vertices and edges where:

1. Each edge is incident to its preceding and succeeding vertices.
2. Vertices and edges can repeat.

Example: In a graph with vertices $A,B,C,D$ and edges $AB,BC,CD$, the sequence $\left.A\rightarrow B\rightarrow C\rightarrow D\right.$ is a walk.

#### **Path**

A **path** is a specific type of walk where no vertex or edge is repeated. Paths are finite and simple.

Example: If a graph has vertices $A,B,C,D$ with edges $AB,BC,CD$, $\left.A\rightarrow B\rightarrow C\rightarrow D\right.$ is a path.

#### **Circuit**