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| **SESSION** | **APRIL 2025** |
| **PROGRAM** | **MASTER OF COMPUTER APPLICATIONS (MCA)** |
| **SEMESTER** | **I** |
| **COURSE CODE & NAME** | **DCA6108 DISCRETE MATHEMATICS & GRAPH THEORY** |
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### **SET - I**

**1. Find the inverse of the matrix**

$$A=\left[\begin{matrix}3&-1&1\\-15&6&-5\\5&-2&1\end{matrix}\right]$$

**using the adjoint method.**

### **Ans 1.**

### **Inverse of a Matrix Using Adjoint Method**

We are given the matrix:

$$A=\left[\begin{matrix}3&-1&1\\-15&6&-5\\5&-2&1\end{matrix}\right]$$

**Step 1: Find the Determinant of A (|A|)**

Using cofactor expansion (along the first row):

$$∣A∣=3⋅∣\begin{matrix}6&-5\\-2&1\end{matrix}∣-\left(-1\right)⋅∣\begin{matrix}-15&-5\\5&1\end{matrix}∣+1⋅∣\begin{matrix}-15&6\\5&-2\end{matrix}∣$$

Calculate each 2×2 determinant:

* $∣\begin{matrix}6&-5\\-2&1\end{matrix}∣=\left(6\right)\left(1\right)-\left(-5\right)\left(-2\right)=6-10=-4$
* $∣\begin{matrix}-15&-5\\5&1\end{matrix}∣=\left(-15\right)\left(1\right)-\left(-5\right)\left(5\right)=-15+25=10$
* $∣\begin{matrix}-15&6\\5&-2\end{matrix}∣=\left(-15\right)\left(-2\right)-\left(6\right)\left(5\right)=30-30=0$

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**2. Find the solution to the following system using elimination:**

$$3x+4y+z=10-3y+5z=-9x+2y+z=6$$

### **Ans 2.**

### **Solving System of Equations Using Elimination Method**

Given system:

$$3x+4y+z=10 (1)-3y+5z=-9 (2)x+2y+z=6 (3)$$

**Step 1: Eliminate x from Equations (1) and (3)**

From (1):

**3. Let** $\left.f:A\rightarrow B,g:B\rightarrow C,and h:C\rightarrow D\right.$**. If** $f\left(x\right)=x+4,g\left(y\right)=3y,and h\left(z\right)=z-1$**, find the composition** $h∘g∘f\left(x\right)$**, also check the bijective-ness of mappings. Marks:**

### **Ans 3.**

### **Function Composition and Bijective Nature**

Given:

* Sets: $A=B=C=Z$ (Set of integers)
* Functions:
	+ $f\left(x\right)=x+4$
	+ $g\left(y\right)=3y$
	+ $h\left(z\right)=z-1$

We are asked to:

**4. Verify that** $\left.\left(p\rightarrow q\right)∨\left(¬q\rightarrow ¬p\right)=True\right.$

### **Ans 4.**

### **Propositional Logic Verification**

We are given a proposition:

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

and asked to verify whether it is **always true** (i.e., a **tautology**).

**Step 1: Understand the Expressions**

**5. The table shows the height distribution (in cm) of students in a school:**

| **Height (cm)** | **Frequency** |
| --- | --- |
| **140 - 150** | **5** |
| **150 - 160** | **12** |
| **160 - 170** | **17** |
| **170 - 180** | **8** |
| **180 - 190** | **5** |

**Find the median height of the students.**

### **Ans 5.**

### **Median of Height Distribution**

Given table:

| Height (cm) | Frequency (f) |
| --- | --- |
| 140 – 150 | 5 |
| 150 – 160 | 12 |
| 160 – 170 | 17 |
| 170 – 180 | 8 |

**6. Explain the Degree in Directed Graph.**

### **Ans 6.**

### **Degree in Directed Graph**

**Definition of Degree in Directed Graphs**

In graph theory, a directed graph (digraph) is a set of vertices connected by directed edges (arcs). Each edge has a direction, meaning it goes from one vertex to another.

In a directed graph, each vertex has two degrees:

1. In-degree (deg⁻): Number of edges coming into a vertex.