

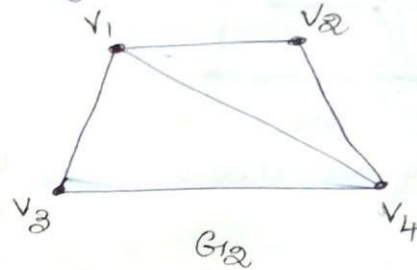
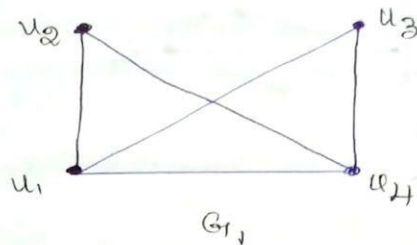


## UNIT 3- GRAPHS

## Graph Isomorphism

Isomorphism & Adjacency:

1. Test the Isomorphism of the graphs by considering their adjacency matrices.



Soln.

Let  $A_1$  and  $A_2$  be the adjacency matrices of  $G_1$  and  $G_2$  respectively.

$$A_1 = \begin{matrix} & \begin{matrix} u_1 & u_2 & u_3 & u_4 \end{matrix} \\ \begin{matrix} u_1 \\ u_2 \\ u_3 \\ u_4 \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix} \end{matrix}$$

$$A_2 = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix} \end{matrix}$$

Adjacency matrices of  $A_1$  and  $A_2$  are similar.

$\therefore G_1$  and  $G_2$  are isomorphic.

2] Test the isomorphism of adjacency matrices

$$A_G = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} \quad \text{and} \quad A_H = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

$$A_G = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

$$\approx \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 1 \end{bmatrix} \quad C_1 \leftrightarrow C_3$$

$$\approx \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix} \quad R_1 \leftrightarrow R_3$$

$$A_G \approx A_H$$

$\therefore A_G$  and  $A_H$  are isomorphic.