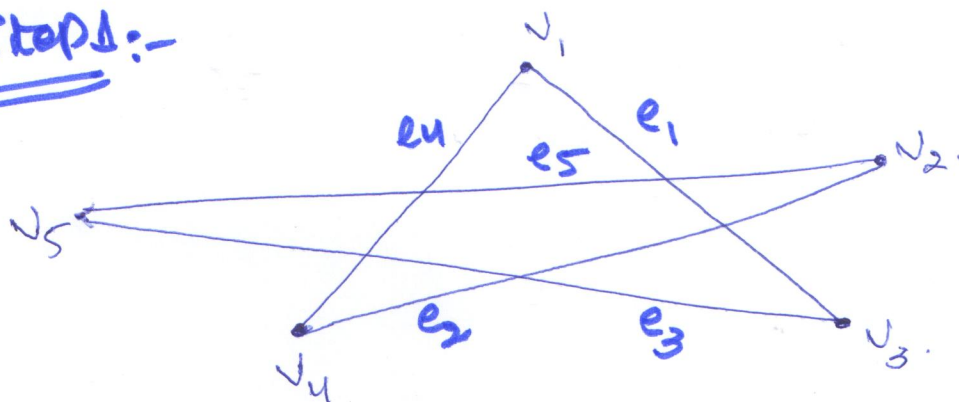


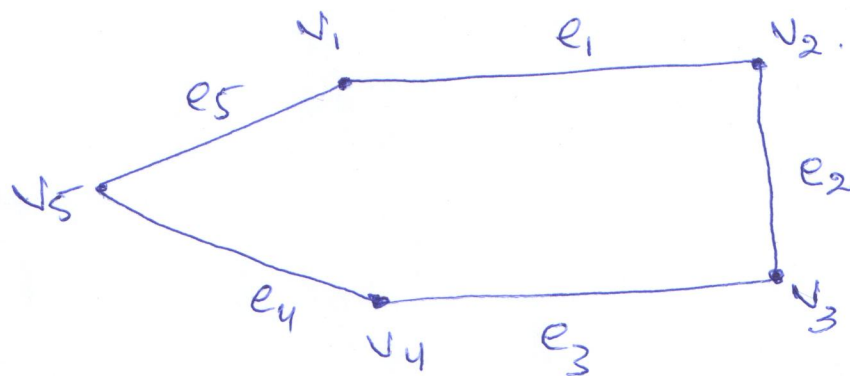
①.

Graph G'

Steps:-



Graph G



It is obvious that the Graph G and G' are same. In the language of graph theory, one can say $G \cong G'$ ($\cong$; isomorphic

Notation).

But the question is, How one can say that

$G \cong G'$? To answer this, we define

a bijective mapping $f: G_v \rightarrow G'_v$ that preserves adjacency.

Procedure:-

②.

In graph G .

STEP 2:-

$$\deg(V_1) = 2$$

$$\deg(V_2) = 2$$

$$\deg(V_3) = 2$$

$$\deg(V_4) = 2$$

$$\deg(V_5) = 2$$

In graph G'

$$\deg(V_1) = 2$$

$$\deg(V_2) = 2$$

$$\deg(V_3) = 2$$

$$\deg(V_4) = 2$$

$$\deg(V_5) = 2$$

In G' Step 3:-

Now,

Neighbourhoods of Vertex $V_1 = \{V_4, V_3\}$

ie $N(V_1) = \{V_3, V_4\}$

$$N(V_2) = \{V_5, V_4\}.$$

$$N(V_3) = \{V_1, V_5\}.$$

$$N(V_4) = \{V_1, V_2\}$$

$$N(V_5) = \{V_2, V_3\}.$$

In G .

(3).

$$N(v_1) = \{v_2, v_5\}.$$

$$N(v_2) = \{v_1, v_3\}$$

$$N(v_3) = \{v_2, v_4\}$$

$$N(v_4) = \{v_3, v_5\}$$

$$N(v_5) = \{v_1, v_4\}$$

Now;

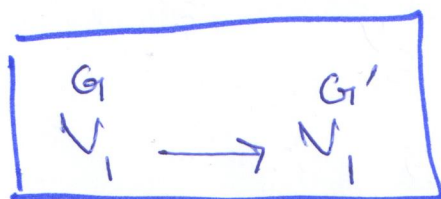
STEP 4:-

In this step; the vertices of both graphs are mapped to each other in a systematic way;

- map same degree vertices to same degree

That is we can map v_1 to any other vertex of Graph G' that also have same degree as v_1 in G .

Let if



After this mapping; map the neighbourhoods of v_1 in G to the neighbourhoods of v_1 in G' .
That is

v_2 in G can be mapped to
 v_3 or v_4 in G'

(4)

Let $\boxed{\begin{matrix} G & & G' \\ V_2 & \rightarrow & V_3 \end{matrix}}$

then $\boxed{\begin{matrix} G & & G' \\ V_5 & \rightarrow & V_4 \end{matrix}}$

Now of $\boxed{\begin{matrix} G & & G' \\ V_3 & \rightarrow & V_5 \end{matrix}}$

then map the Neighbourhoods of V_3 in G to the neighbourhoods of V_5 in G' .

That is $\boxed{\begin{matrix} G & & G' \\ V_4 & \rightarrow & V_2 \end{matrix}}$

Step 5:-

Now in similar fashion; the mapping

of edges can be observed—but this mapping must be related to vertex mapping defined above.

Since $\left. \begin{matrix} G & & G' \\ V_1 & \rightarrow & V_1 \\ V_2 & \rightarrow & V_3 \end{matrix} \right\} \begin{matrix} \text{the edge between } V_1 \text{ and } V_2 \\ \text{is } e_1 \text{ in } G \\ \text{and the edge between } V_1 \text{ and } \\ V_3 \text{ is } e_1 \text{ in } G' \end{matrix}$

$\therefore \boxed{e_1 \rightarrow e_1}$

Now $\left. \begin{matrix} G & & G' \\ V_1 & \rightarrow & V_1 \\ V_5 & \rightarrow & V_4 \end{matrix} \right\} \begin{matrix} \text{the edge between } V_1 \text{ and } \\ V_5 \text{ is } e_5 \\ \text{and the edge between } V_1 \\ \text{and } V_4 \text{ is } e_4. \end{matrix}$

$\therefore \boxed{e_5 \rightarrow e_4}$

$$\left. \begin{array}{l} G \quad G' \\ v_5 \rightarrow v_4 \\ \text{and } v_4 \rightarrow v_2 \end{array} \right\} \quad \begin{array}{l} v_5 \xrightarrow{e_4} v_4 \\ \text{and } v_4 \xrightarrow{e_2} v_2 \end{array}$$

$\therefore e_4 \rightarrow e_2.$

$$\left. \begin{array}{l} G \quad G' \\ v_4 \rightarrow v_2 \\ \text{and } v_3 \rightarrow v_5 \end{array} \right\} \quad \begin{array}{l} v_4 \xrightarrow{e_3} v_3 \\ \text{and } v_2 \xrightarrow{e_5} v_5 \end{array}$$

$\therefore e_3 \rightarrow e_5.$

$$\left. \begin{array}{l} G \quad G' \\ v_3 \rightarrow v_5 \\ v_2 \rightarrow v_3 \end{array} \right\} \quad \begin{array}{l} v_3 \xrightarrow{e_2} v_2 \\ v_5 \xrightarrow{e_3} v_3 \end{array}$$

$\therefore e_2 \rightarrow e_3.$