Unit – III

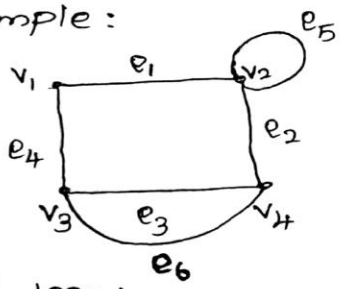
Graphs

Graph:

A graph $G = (V, E, \phi)$ consists of a non empty set $V = \{v_1, v_2, \ldots\}$ called the set of vertices and $E = \{e_1, e_2, \ldots\}$ is said to be the set of edges of the graph, ϕ is a mapping from the set of edges E to set of ordered or unordered pairs of elements of V.

The vertices are represented by points and each edge is represented by a line diagrammatically.

Example:



$V = \{v_1, v_2, v_3, v_4\}$

$E = \{e_1, e_2, e_3, e_4, e_5, e_6\}$

Self loop:

If there is an edge from v_i to v_i then that edge is called self loop or simply loop.

In the figure, e_5 is a self loop.

Parallel Edges:

If two edges have same end points then the edges are called parallel edges.

In the figure, e_3 and e_6 are parallel edges.

Incident:

If the vertex v_i is an end vertex of some edge e_k, then e_k is said to be incident with v_i.

Eg: e_4 is incident with v_1 and v_2.

Adjacent Vertices and Edges

Two edges are said to be adjacent if they are incident on a common vertex.

Two vertices v_i and v_j are said to be adjacent if they are $v_i v_j$ is an edge of the graph.

Eg: e_1 and e_4 are adjacent edges.
v_1 and v_3 are adjacent vertices.

Simple graph:

A graph which has neither self loops nor Parallel edges is called a simple graph.

Isolated vertex:

A vertex having no edge incident on it is called an isolated vertex.
For an isolated vertex, degree is zero.

Pendant vertex

If the degree of any vertex is one, then that vertex is said to be a pendantant vertex.

Directed Edges:

In a graph $G=(V, E)$ an edge which is associated with an ordered pair of $V \times V$ is called a directed edge of G.

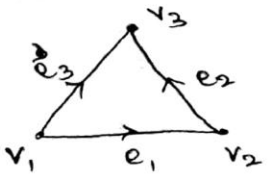
Digraph:

A graph in which every edge is directed edge is called a digraph (or) directed graph.

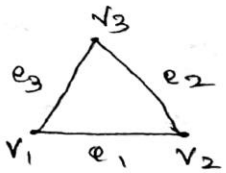
Undirected graph:

A graph in which every edge is undirected is called an undirected graph.

Eg:



Directed Graph



undirected graph

Mixed graph:

If some edges are directed and some are undirected in a graph, the graph is called mixed graph.

Multi graph:

A graph which contains some parallel edges is called a multigraph.

Pseudograph:

A graph in which loops and parallel edges are allowed as a pseudograph.