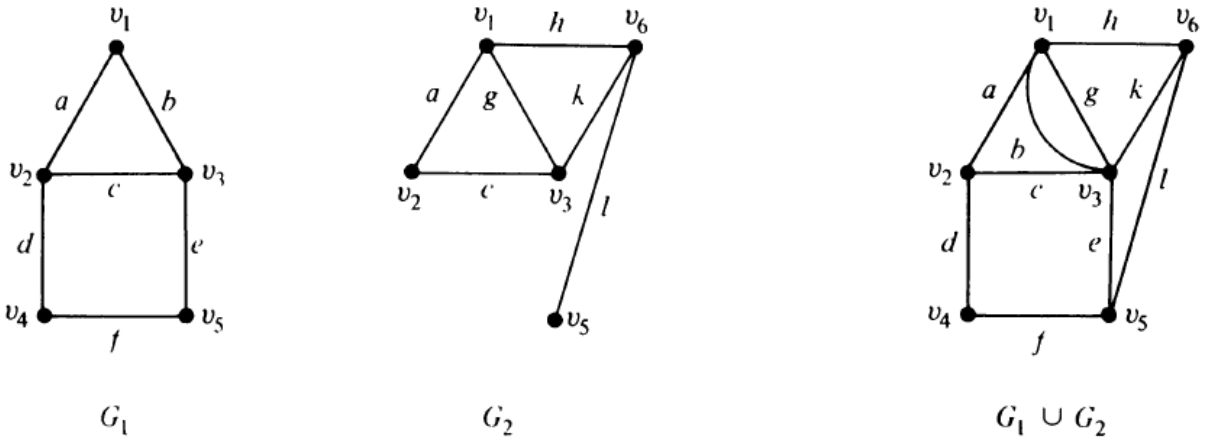
Unit IV
Operations on Graphs

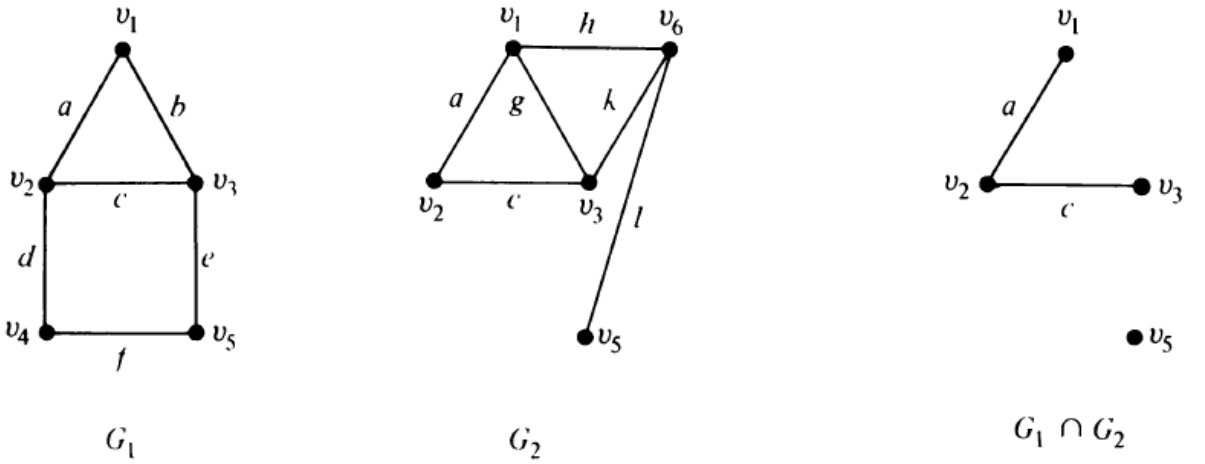
1. Union of two graphs

Let G1 = (V1, E1) and G2 = (V2, E2) are two connected graphs then their union is a graph G where G = G1 U G2 whose vertex set V = V1 U V2 and the edge set is E = E1 U E2.



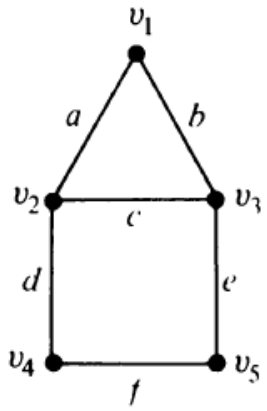
2. Intersection of two graphs

Let G1 = (V1, E1) and G2 = (V2, E2) are two connected graphs then their union is a graph G where G = G1 $\cap$ G2 whose vertex set V = V1 $\cap$ V2 and the edge set is E = E1 $\cap$ E2.

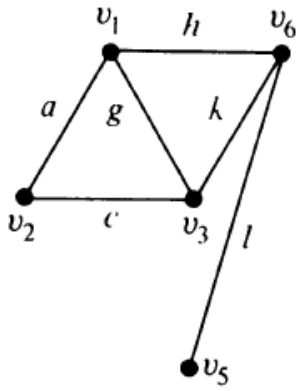


3. Ring sum of two graphs

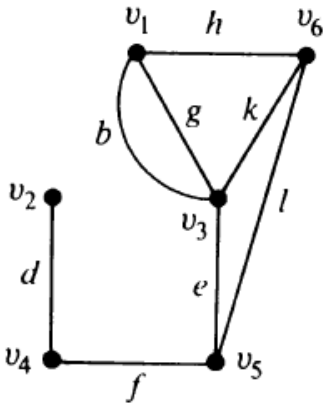
The ring sum of two graphs G1 and G2 is a graph consisting of the vertex set V1 U V2 and of edges that are either in G1 or G2, but not in both. Ring sum of two graph is represented by G1 $\oplus$ G2.



G_1



G_2

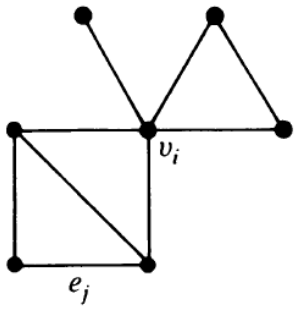


$G_1 \oplus G_2$

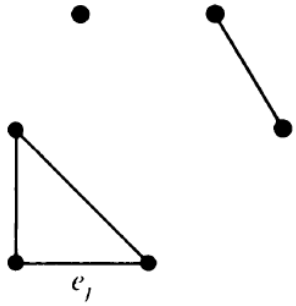
4. Deletion

If *vi* is a vertex in graph G, then G – *vi* denotes a subgraph of G obtained by deleting *vi* from G. Deletion of vertex always implies the deletion of all edges incident on that vertex.

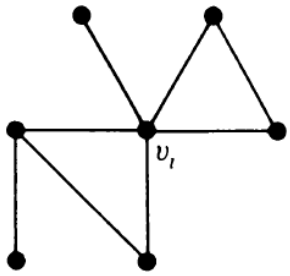
If *ej* is an edge in graph G then G – *ej* is a subgraph of G obtained by deleting edge *ej* from G. Deletion of an edge does not imply deletion of its end vertices. Therefore G – *ej* = G $\oplus$ *ej*.



G



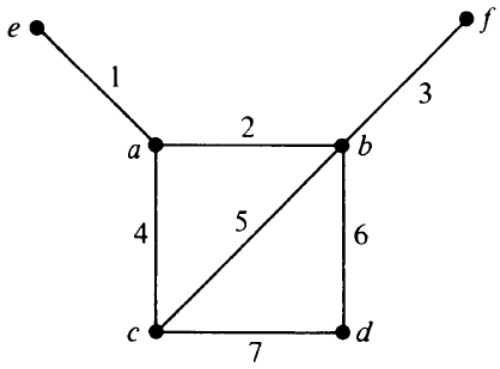
$(G - v_i)$

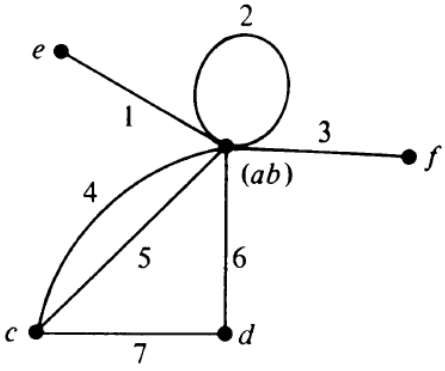


$(G - e_j)$

5. Fusion

A pair of vertices a, b in a graph are said to be fused (merged or identified) if the two vertices are replaced by a single new vertex such that every edge that was incident on either a or b or on both is incident on the new vertex. Thus fusion of two vertices does not alter the number of edges, but it reduces the number of vertices.


e
f
1
3
2
a
b
4
5
6
c
d
7


2
e
1
3
f
(ab)
4
5
6
c
d
7