Graphs Subgraphs

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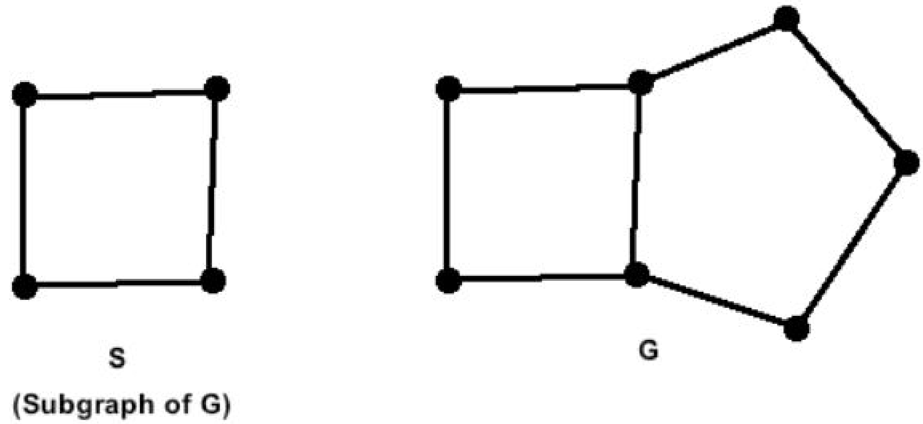
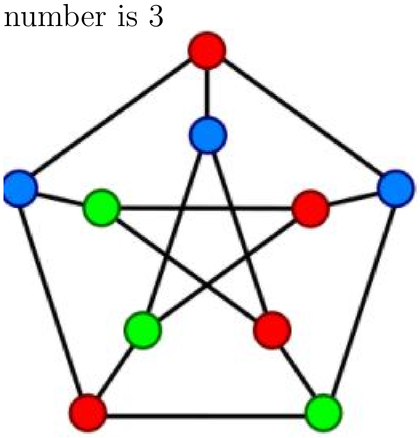
SubGraph : A graph S is called as subgraph of G iff vertex set V(S) is a subset of the vertex set V(G) i.e V(S) $\subseteq$ V(G) and also the edges E(S) is the subset of edges E(G) i.e E(S) $\subseteq$ E(G)



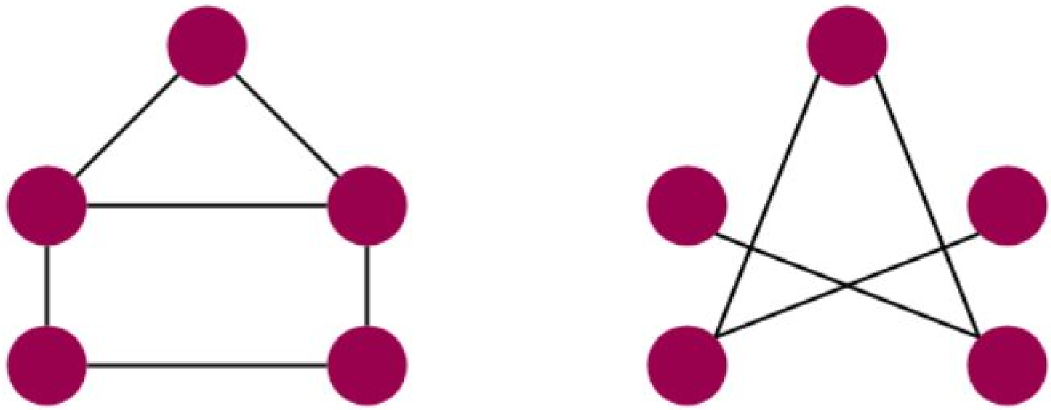
Some of the basic terms used in Graph are: 1. Independent Set and Clique 2. Chromatic Number 3. Complement of a graph 4. Representation of Graph using Adjacency matrix/Incident matrix 5. Isomorphism 6. Decomposition and Special Graph

1. **Independent Set and Clique** : A pair of non adjacent vertices is called as Independent set or **Stable** set A pair of adjacent vertices is called as **Clique** set

2. **Chromatic Number** : Minimum number of colors needed to label the vertices in such a way that adjacent vertices gets different color .Here in below fig we can see chromatic number is 3

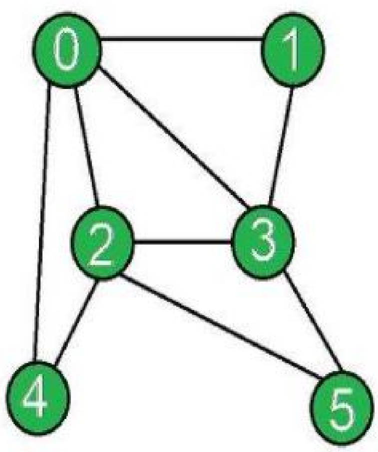


3. **Complement of a Graph** : A graph $\overline{G}$ will be the complement of Graph G iff $\overline{G}$ is having same set of vertices and if there exist an edge between any pair of u w vertices in $\overline{G}$ then there should not be any edge between a pair of u w vertices in original graph.



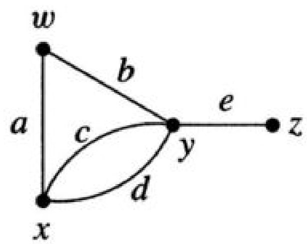
Graph G   Complement Graph $\overline{G}$

4. **Representation of Graph using Adjacency matrix/Incident matrix**:
Adjacency matrix is representation of a graph in terms of boolean values like 0's and 1's and boolean value of the matrix as 1 signifies that there is a direct path between two vertices



	0	1	2	3	4	5
0	0	1	1	1	1	0
1	1	0	0	1	0	0
2	1	0	0	1	1	1
3	1	1	1	0	0	1
4	1	0	1	0	0	0
5	0	0	1	1	0	0

Incident matrix is representation of a graph in matrix form in such a way that there exist a column for each vertices and row for each edge



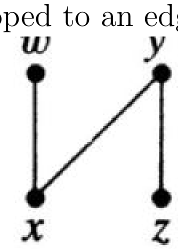
G

$$\begin{array}{c}
\\ w \\ x \\ y \\ z
\end{array}
\begin{array}{c}
\begin{array}{ccccc} a & b & c & d & e \end{array} \\
\begin{pmatrix}
1 & 1 & 0 & 0 & 0 \\
1 & 0 & 1 & 1 & 0 \\
0 & 1 & 1 & 1 & 1 \\
0 & 0 & 0 & 0 & 1
\end{pmatrix}
\end{array}$$

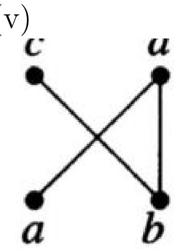
$M(G)$

5. **Isomorphism**: It is an equivalent relation on set of simple graphs and it should satisfy these 3 properties
Reflexive ,Symmetric ,Transitive So isomorphism from a graph G to H is a bijection which maps V(G) to V(H) and E(G) to E(H) in such a way that edge of G with endpoints u and v is mapped to an edge with endpoints f(u) and f(v)

G



H



6. **Decomposition and Special Graph**:It is the list of subgraphs in such a way that each edge appears in exactly one subgraph in the list