UNIT 1

Graph Theory

Contents

1. Graph of a Network definitions
2. Tree and co tree
3. Link, basic loop
4. Basic cut set
5. Incidence matrix
6. Cut set matrix
7. Tie set matrix
8. Duality
9. Loop and Nodal methods of analysis.

Path (Walk):

A sequence of branches going from one node to other is called path. The node once considered should not be again considered the same node.

Loop (Closed Path):

Loop may be defined as a connected sub-graph of a graph, which has exactly two branches of the sub-graph connected to each of its node.

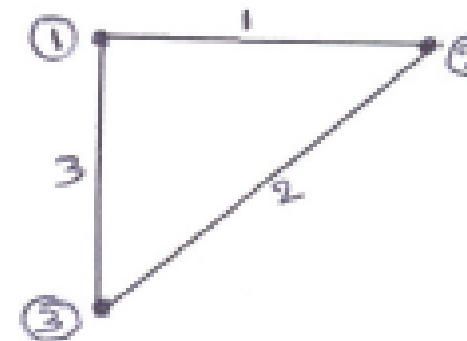For example, the branches 1, 2 & 3 in figure 7 constitute a loop.

Fig.7 Loop

Planar and Non-planar Graphs:

A planar graph is one where the branches do not cross each other while drawn on a plain sheet of paper. If they cross, they are non-planar.
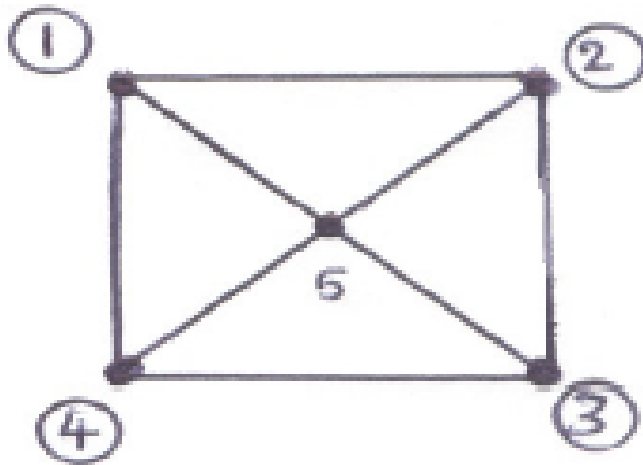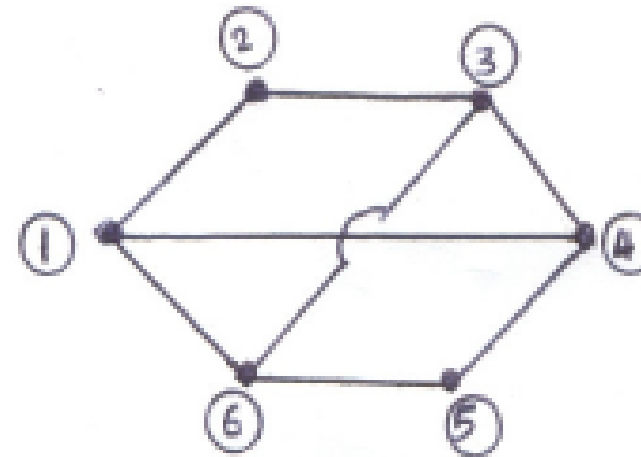

Fig.8 Planar Graph

Fig.9 Non-planar graph

Oriented Graph:

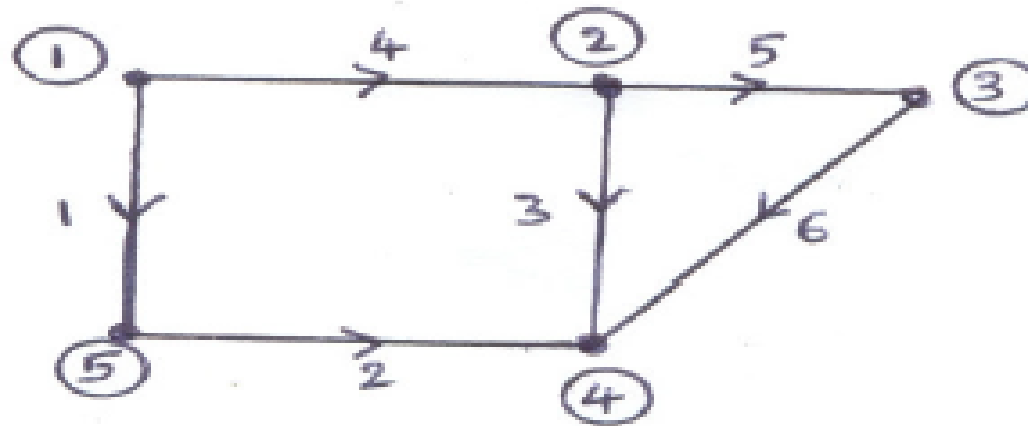The graph whose branches carry an orientation is called an oriented graph

Fig.10 Oriented Graph

The current and voltage references for a given branches are selected with a +ve sign at tail side and −ve sign at head

Tree:

Tree of a connected graph is defined as any set of branches, which together connect all the nodes of the graph without forming any loops. The branches of a tree are called **Twigs**.

Co-tree:

Remaining branches of a graph, which are not in the tree form a co-tree. The branches of a co-tree are called **links** or **chords**.

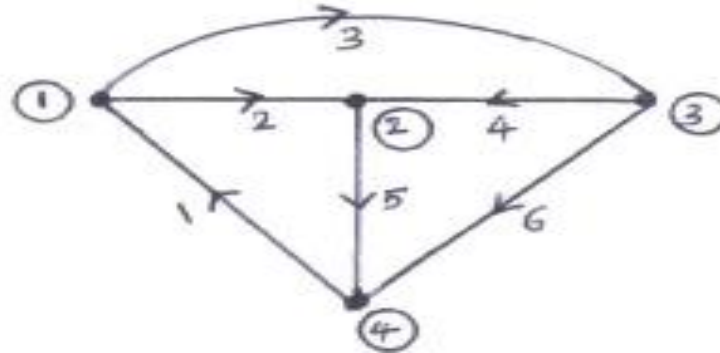The tree and co-tree for a given oriented graph shown in figure11 is shown in figure12 and figure13.
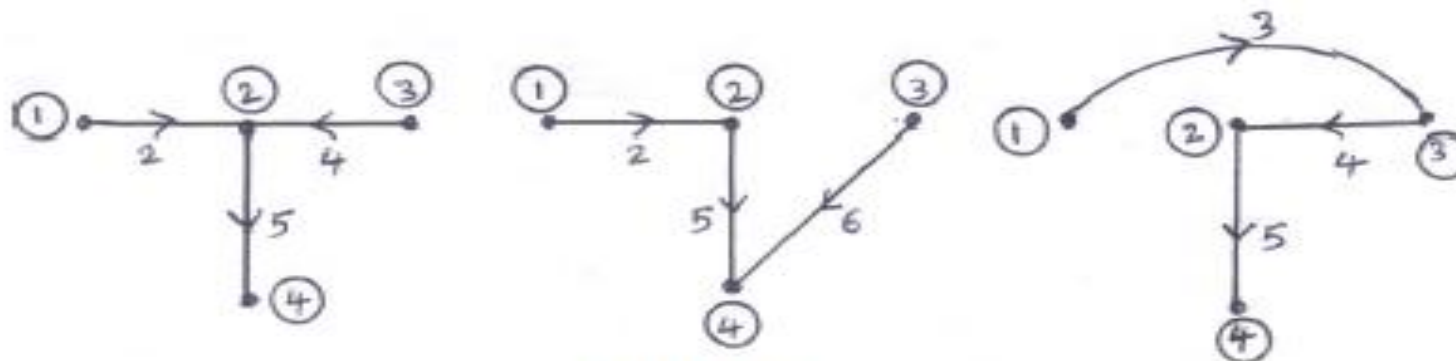
Fig. 11 Oriented Graph

Fig.12 Trees
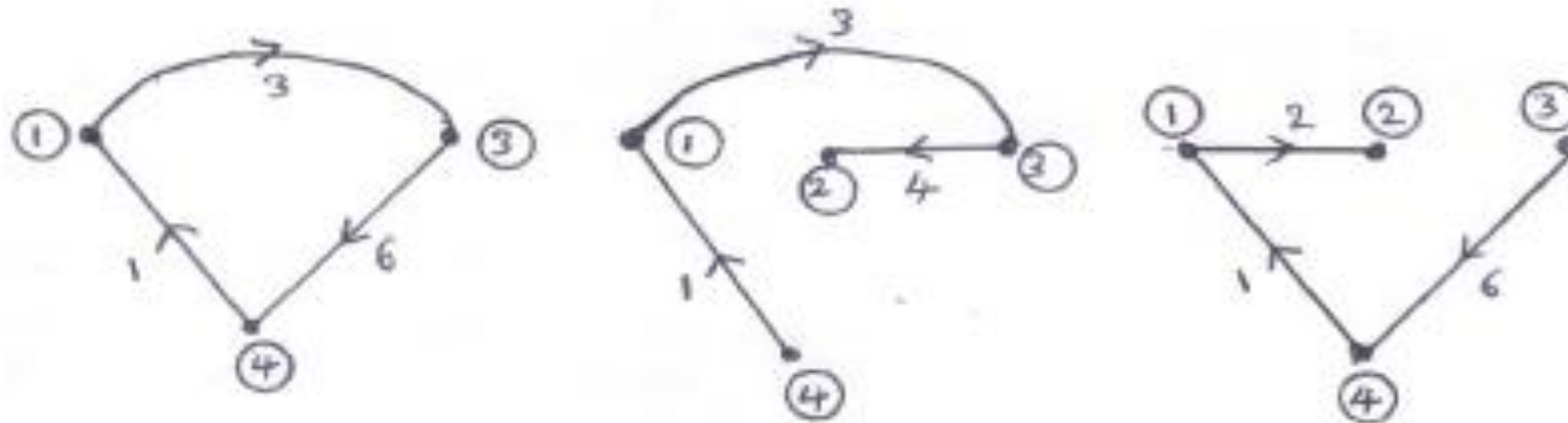
Fig.13 Co-trees

Tree	Twigs	Links (Chords)
1	2, 4 & 5	1, 3 & 6
2	3, 4 & 5	1, 2 & 6
3	2, 5 & 6	1, 3 & 4

References

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6. K.M. Soni, " Network Theory", S.K. Kataria Publication