NETWORK ANALYSIS AND SYNTHESIS

Unit 1

Graph Theory

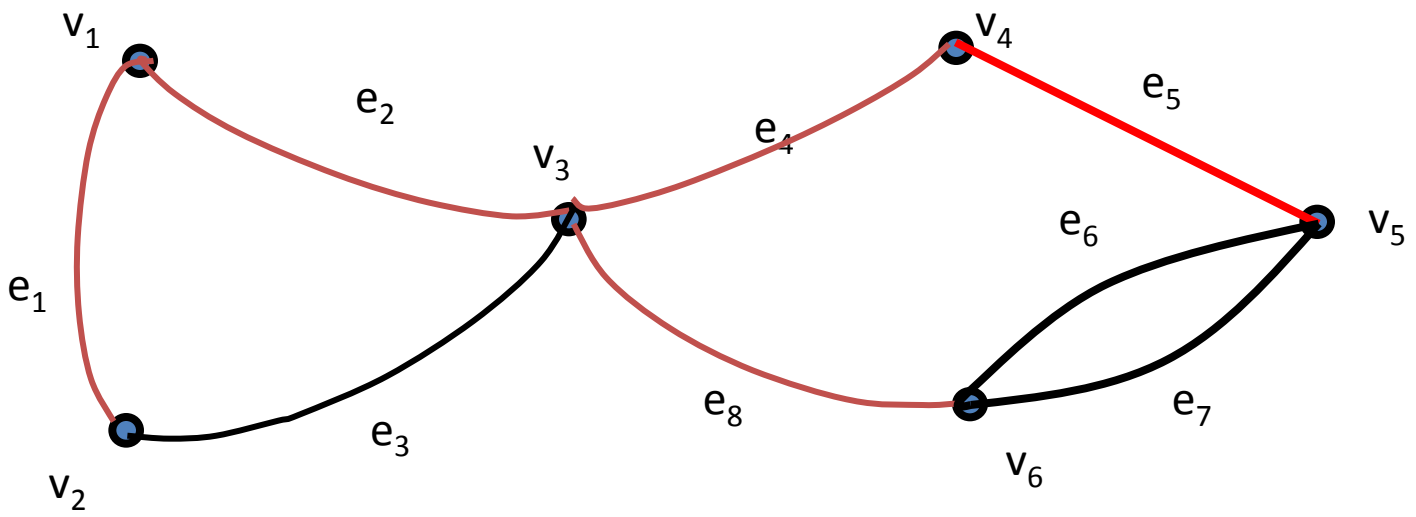
Basic Concepts of the Graph Theory

- DEFINITION: The cut-set of a graph G is the subgraph G_x of G consisting of the set of edges satisfying the following properties:
  - The removal of G_x from G reduces the rank of G exactly by one.
  - No proper subgraph of G_x has this propery.

  If G is connected then the first property in the above definition can be replaced by the following phrase.
  - The removal of G_x from G separates the given connected graph G into exactly two connected subgraphs.

Basic Concepts of the Graph Theory

Consider the following graph and the following set of edges



$G_1=\{e_1,e_2\}$ → is also a cut-set

$G_2=\{e_4,e_6,e_7\}$ → Cut-set

$G_3=\{e_2,e_3,e_4,e_8\}$ → is not a cut-set, because the removal of G_3 from G results in three connected subgraphs

$G_4=\{e_2,e_3,e_6\}$ → is not a cut-set, because a subset of G_4 is cut-set

Basic Concepts of the Graph Theory

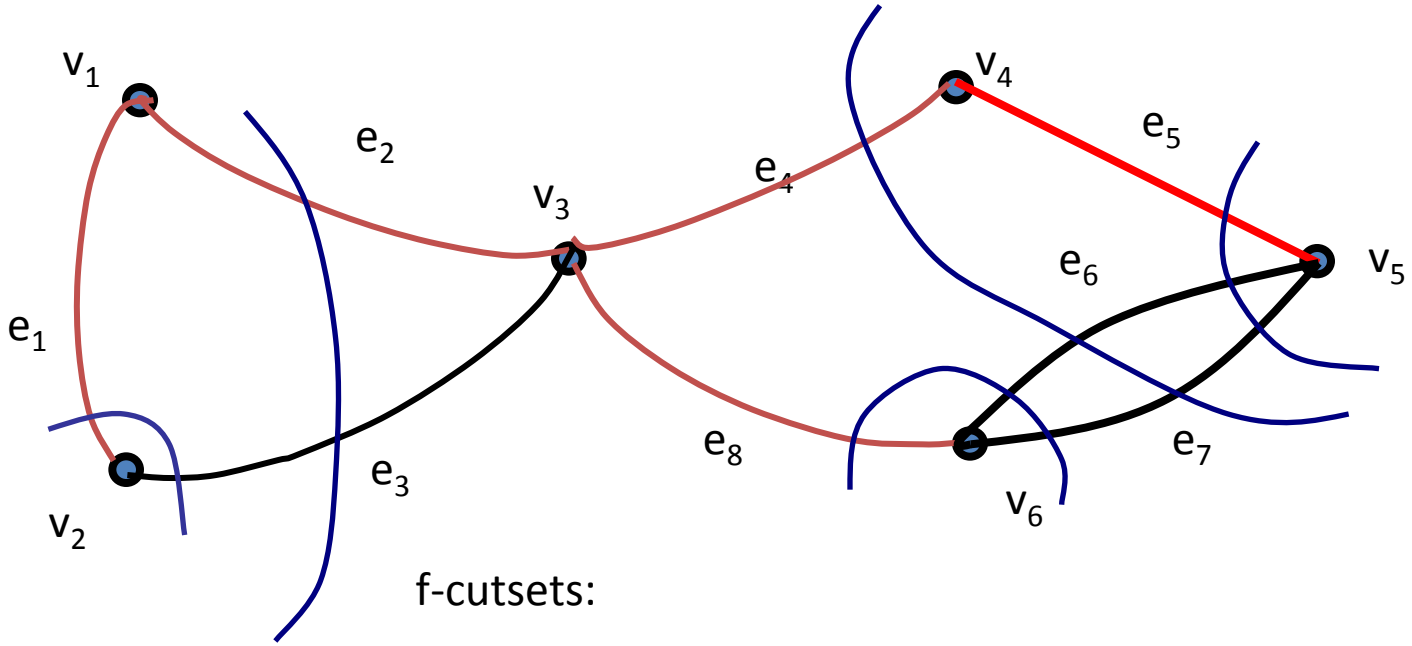
- DEFINITION: Let G be a connected graph and let T be its tree. The branch $e_t \subseteq T$ defines a unique cut-set (a cut-set which is formed by e_t and the chords of G). This cut-set is called the fundamental cut-set (f-cutset) of G. All such cut-sets defined by all the branches of T are called the fundamental cut-sets (f-cutsets) of G. If G is not connected then the f-cutsets are defined with respect to a forest.

Basic Concepts of the Graph Theory

- Note that the number of fundamental cut-sets is given by the rank of G and with respect to a chosen tree T of G, each fundamental cut-set contains one and only one branch.

Basic Concepts of the Graph Theory

Consider the following graph



f-cutsets:

$x_{f1}=\{e_1,e_3\}$

$x_{f2}=\{e_2,e_3\}$

$x_{f3}=\{e_4,e_6,e_7\}$

$x_{f4}=\{e_5,e_6,e_7\}$

$x_{f5}=\{e_8,e_6,e_7\}$

THANKS….

Queries Please…