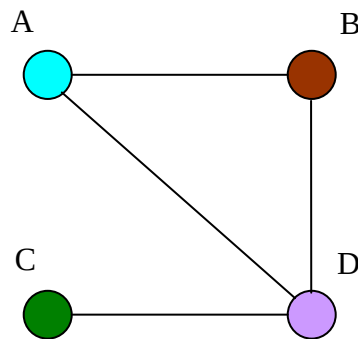


HOMEWORK PROBLEMS #3

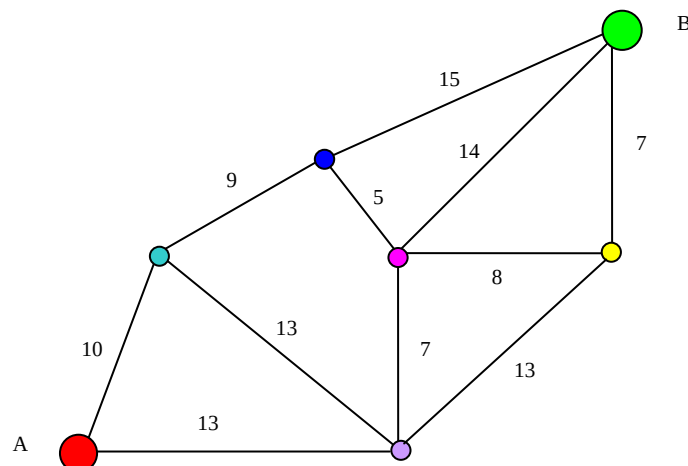
3-1 Consider the following graph.

- (i) Find its adjacency, incidence and Laplacian matrices.
- (ii) Find its complementary graph.
- (iii) Find all of its disconnecting sets and cut sets.
- (iv) Find its edge connectivity and node connectivity.
- (v) Find a spanning tree of the graph.



3-2 Consider the Adjacency matrix, Incidence matrix and Laplacian matrix of a graph. Is it true that from any one matrix you can always find the other two matrices? If yes, explain why; if not, show a counterexample.

3-3 Consider a computer network in a lab, as shown by the following figure, where each node is a computer (Router or PC) and the numbers indicate the lengths of optical fibers needed if the computers are connected.



- (a) Design a best possible cost-effective Personal Area Network (PAN) by connecting all nodes together, so that every computer can communicate with every other one while the total optical fiber used is the shortest. Show your design steps.
- (b) Find the shortest path from computer A to computer B, which uses the shorter possible optical fiber. Show your calculation steps.

3-4 For the star-shaped network of size N shown in the following graph, find its average node-betweenness and average edge-betweenness.

