Reading List for Exam 3 (In-class part)

All questions from Module 9 - Graphs

1) Given a bipartite graph, run the Breadth First Search (BFS) algorithm on the graph: indicate the level numbers of the vertices and identify the tree edges and cross edges, using all of which determine the two partitions of the graph.

2) Run the Depth First Search (DFS) algorithm on a given graph to identify the articulation points and bridge edges.
(a) Briefly explain your analysis procedure to identify the articulation points among the vertices and the bridge edges among the edges.
(b) For each edge u-v that is "not a bridge edge", identify one or more back edges that are responsible for making u-v to be not a bridge edge.

3) Run the Depth First Search (DFS) algorithm on a given directed graph.
(a) Identify the different types of edges as part of DFS.
(b) Determine the push and pop order of the vertices.
(c) Determine the strongly connected component(s) of the graph
(d) Determine the weakly connected component(s) of the graph

4) Given an undirected graph, run the Depth First Search (DFS) algorithm.
(a) Draw the DFS tree with tree edges and back edges
(b) Assign directions to the tree edges and back edges such that the resulting directed graph has all the vertices in one strongly connected component. Show all the work.

5) Run the Depth First Search algorithm on a given directed acyclic graph (DAG) and determine a topological sort of the vertices as well as identify the tree edges, forward edges and cross edges.

6) Given an undirected graph.
(a) Determine the degree values of the vertices and the probability of observing a vertex with a certain degree.
(b) Using (a), determine the average degree of the vertices and the number of edges in the graph.
(c) Assign directions to the edges such that the resulting directed graph is a directed acyclic graph with a given topological sort of the vertices.
(d) Without running DFS, what can you say about the strongly connected components of the directed graph obtained in (c)?