

CMS C 641

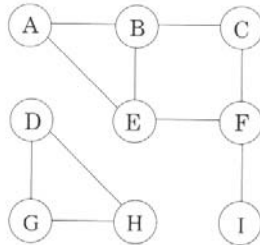
Homework 6

Reading Assignment:

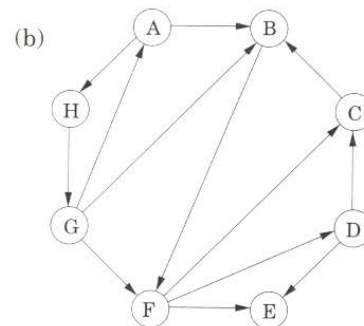
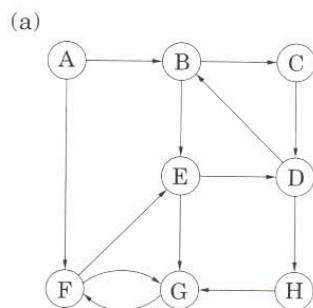
- Listen to Berlioz's *Symphonie Fantastique*
- Read chapter 22 of text, and chapters 3 & 4 of *Algorithms* by Dasgupta, Papadimitriou, & Vazirani (DPV).

Homework:

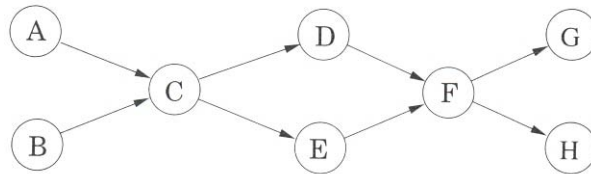
1. Exercise 22.1-2, page 592 of text.
2. Perform a depth-first search on the following graph: whenever there's a choice of vertices, pick the one that is alphabetically first. Draw the resulting depth-first search forest. Classify each edge as a tree edge or back edge, and give the pre and post numbers of each vertex.



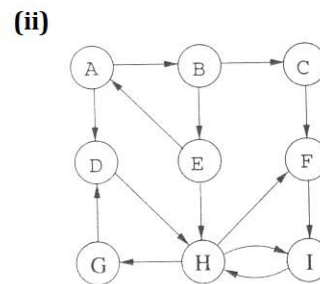
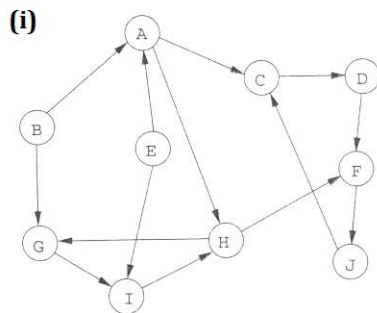
3. Perform depth-first search on each of the following graphs: whenever there's a choice of vertices, pick the one that is alphabetically first. For each graph, draw the resulting depth-first search forest. For each graph, classify each edge as a tree edge, forward edge, back edge, or cross edge, and give the pre and post number of each vertex.



4. Run the DFS-based topological ordering algorithm on the following graph. Whenever there is a choice of vertices to explore, always pick the one that is alphabetically first.



- (a) Draw the resulting topologically ordered graph
- (b) What are the sources and sinks of the graph?
- (c) How many topological orderings does this graph have?
5. Run the strongly connected components algorithm on each of the following directed graphs G . When doing DFS on G^R : whenever there is a choice of vertices to explore, always pick the one that is alphabetically first.



In each case, answer the following:

- (a) In what order are the strongly connected components (SCCs) found?
- (b) Which are source SCCs and which are sink SCCs?
- (c) Draw the “metagraph” (each meta-node is an SCC of G)
- (d) What is the minimum number of edges you must add to this graph to make it strongly connected?