CSE 101 Exam 1

Spring 2016

Instructions: Do not open until the exam starts. The exam will run for 45 minutes. The problems are roughly sorted in increasing order of difficulty. Answer all questions completely. You are free to make use of any result in the textbook or proved in class. You may use up to 6 1-sided pages of notes, and may not use the textbook nor any electronic aids. Write your solutions in the space provided, the pages at the end of this handout, or on the scratch paper provided (be sure to label it with your name). If you have solutions written anywhere other than the provided space be sure to indicate where they are to be found.

Please find a place to sit that is not next to anyone else and does not have anyone sitting directly in front of or behind you.

Name:

ID Number:

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**Question 1** (Topological Sort, 30 points). Provide a linear ordering of the DAG given below. In particular, list the letters A through J in an order consistent with the graph provided. You do not need to explain how you found it.
Question 2 (Connectivity and Pre/Post-Orderings, 35 points). Let $G$ be an undirected graph. Show that $G$ is connected if and only if when performing a depth first search on $G$ that the vertex with the smallest preorder number is the same as the vertex with the largest postorder number.
Question 3 (Subway Navigation, 35 points). A map of a subway system is given by an undirected graph $G$. In addition, each edge of this graph is given a color to designate which of several subway lines that edge is a part of. Give a \textbf{linear time} algorithm that given two vertices of this graph returns the smallest possible number of times that one would need to change lines in order to get from one vertex to the other. You may assume that all the edges in a given line are connected. In particular, it should be possible to get from any station on one line to any other on that line without changing lines.

Partial credit will be given for any correct, polynomial-time algorithm. You do not need to prove correctness or runtime.