Discrete Mathematics Midterm 2b Exam (Spring 2017)

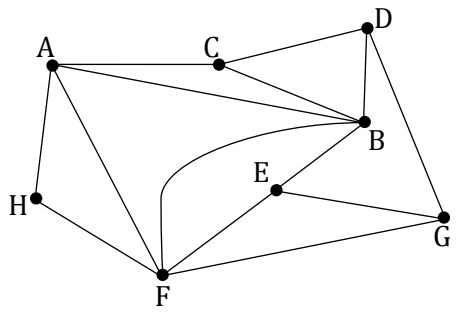
No :

Name:

1. (GRAPH) According to the given adjacency matrix M of the undirected graph,

   a. (30*P*) Is the graph planar? Explain your answer.
   b. (20*P*) How can we determine whether a graph given with only an adjacency matrix is planar or not? (Do not think about specific algorithm, describe your idea only)

$$M=\begin{bmatrix} 0 & 1 & 1 & 0 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 1 & 1 & 0 & 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \end{bmatrix}$$

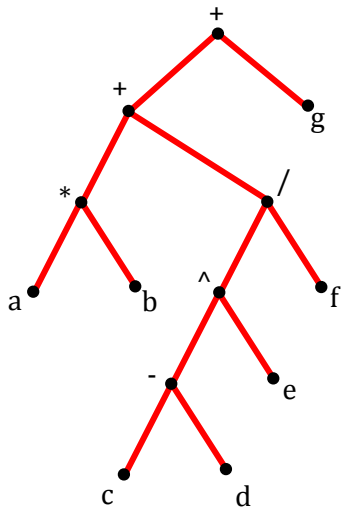


Because there is no edge intersection, this graph is planar.

According to Kuratowski's theorem, if a K_5 or $K_{3,3}$ is subgraph in a graph, it can not be planar. Thus, if we have an algorithm to determine this from an adjacency matrix, we can absolutely understand it.

2. (TREE) Let X be a mathematical operation in infix notation.

   a. (30*P*) For X=(a*b+(c-d)^e/f)+g, draw its tree representation and write its postfix notation.
   b. (20*P*) Write it into prefix notation.



Its postfix notation format:

Left – Right - Root

ab*cd-e^f/+g+

Its prefix notation format:

Root - Left – Right

++*ab/^-cdefg