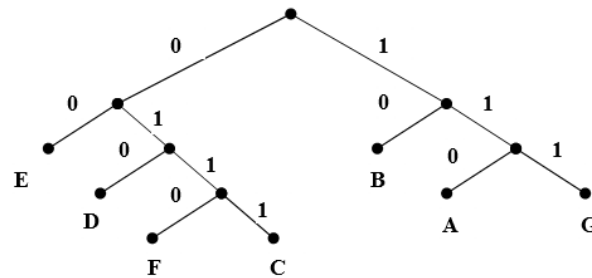
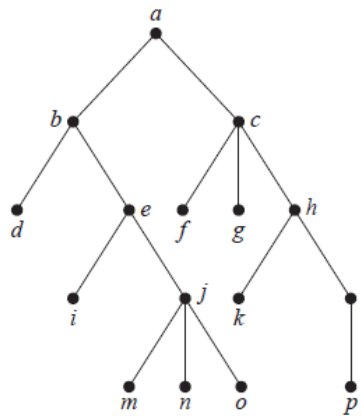


CS330 Homework 10 ***Questions**

- Points = 3. How many leaves does a full 3-ary tree with 99 vertices have?
- Points = 3. Someone starts a chain letter by sending it to 5 people. Each person who receives the letter either sends out 5 copies or no copies. Assume that the chain ended with a total of 100 people having sent out the letter. Assuming nobody received the letter more than once, how many people received the letter and how many received a letter but didn't send any out?
- Points = 2. Build a binary search tree for the words oenology, phrenology, campanology, ornithology, ichthyology, limnology, alchemy, and astrology. Insert the words in that order and keep them sorted alphabetically. Each word you add becomes a new leaf of the tree.
- Points = 3. We have a piece of text with letter frequencies A: 0.10, B: 0.25, C: 0.05, D: 0.15, E: 0.30, F: 0.07, G: 0.08. What is the average number of bits needed to represent a character using the encoding tree below?

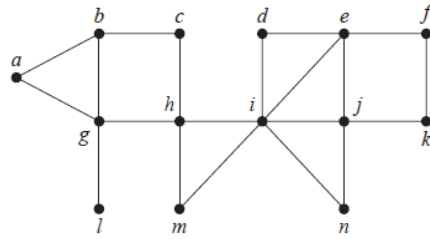


- Points = 6. Consider the tree below. (a) Give the order of visits for a preorder traversal of the tree. (b) Give the order of visits for a postorder traversal of the tree.

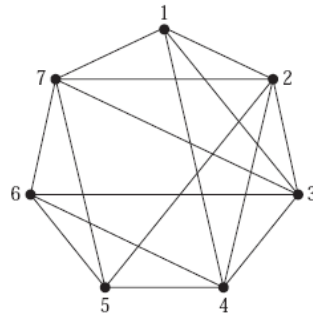


- Points = 6. Consider the expression $((x + 2) \uparrow 3) * (y - (3 + x)) - 5$.
 - Give the representation of the expression as a binary operator tree.
 - Give the prefix notation representation of the expression by traversing the tree in preorder.
 - Like (b) but for postfix and postorder.
- Points = 6. Consider the simple graph below.
 - Give its depth-first-search spanning tree. (Start with a and use alphabetical order to break ties to get the next vertex.)
 - Give its breadth-first-search spanning tree.

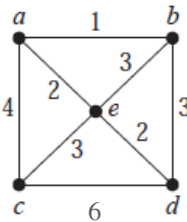
* Some material from MATH230 Dr. Robert Ellis IIT-AMAT, zyBooks Disc. Math., and Disc. Math. and its Appl., Rosen (7th Ed.) is included under the academic/nonprofit Fair Use exception of US Copyright Law. This document must NOT be distributed beyond participants in IIT's CS330.



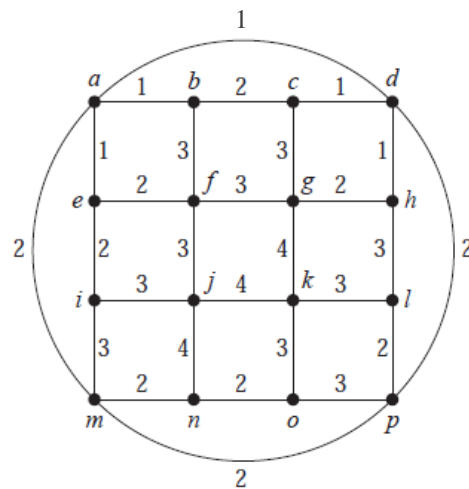
8. Points = 3. Use the greedy algorithm to color the graph below (visit the vertices in numerical order). Argue that the coloring you get is or isn't minimal.



9. Points = 3. Use Prim's algorithm to find a minimum spanning tree for the graph below. Also, what is the weight of the tree? If you have to choose between two edges of the same weight, pick the one whose vertices by alphabetical order (so $ab < ac < bd$, for example)[†].



10. Points = 5. Repeat the previous problem on the graph below.



[†] If you don't mind, I'll abbreviate the edge name $\{a, b\}$ to ab , etc. Note $ab = \{a, b\} = \{b, a\} = ba$ in this case.