

**FLORIDA TECH
DEPARTMENT OF COMPUTER SCIENCES
DATA STRUCTURES AND ALGORITHMS
COMPREHENSIVE EXAM
FALL 2002
(Total of 115 points)**

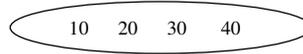
**IN ALL PROGRAMMING QUESTIONS YOU MAY USE ADA,
PASCAL, C, C++, JAVA OR PSEUDO-CODE WITH ENOUGH
DETAILS.**

1. (25 points) When used to sort an array, selection sort works by selecting the element with the largest key value and placing it last in the list. In the next step of the algorithm chooses the largest element but does not consider the last element since it is already in its correct position. The algorithm terminates when all the elements have been placed in their correct positions

Write a recursive algorithm for selection sort that uses the idea described above.

2. (25 points) Write a function that searches for an element in a binary search tree. Your function should stop as soon as the element is found. What is the complexity of your function (use the big-O notation)?

3. (25 points) Given the following B-Tree of order 2. Draw the resulting B-tree after operations below:



NOTE: You'll draw 5 trees in total (one per each letter below)

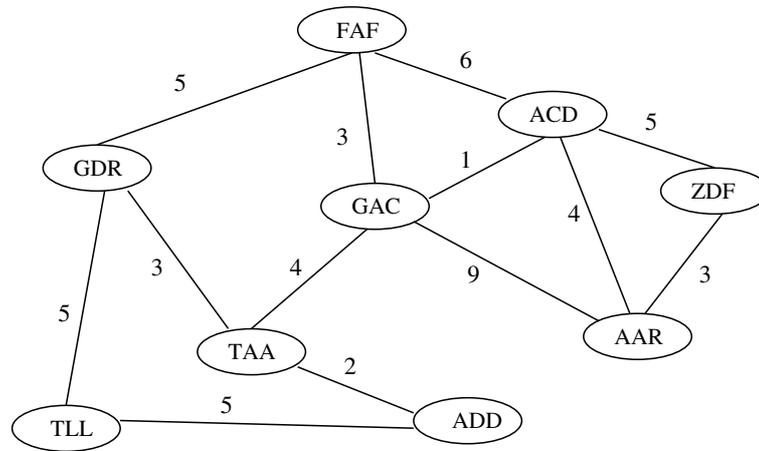
- a) After adding 50, 25, 42, 44 (in this order)
- b) Then after adding 41, 32, 38, 56 (in this order)
- c) Then after adding 34
- d) Then after deleting 32
- e) Then after deleting 34

4. (25 points) Starting from node FAF write the order in which the nodes are visited using:

a) Breadth First Search (nodes visited in lexicographic order):

b) Depth First Search (nodes visited in lexicographic order):

c) Priority First Search (the priority of a is given by the edge used to reach the node. The larger the number the higher is the priority)



5. (15 points) hashing is a very important technique in computer science:

a) Shortly describe a case where you might use hashing

b) Describe two techniques for handling collision in hash functions