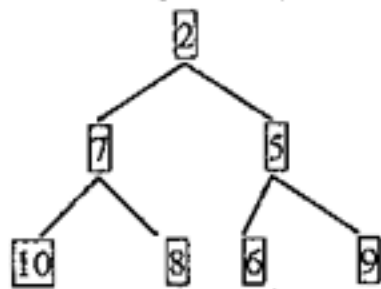


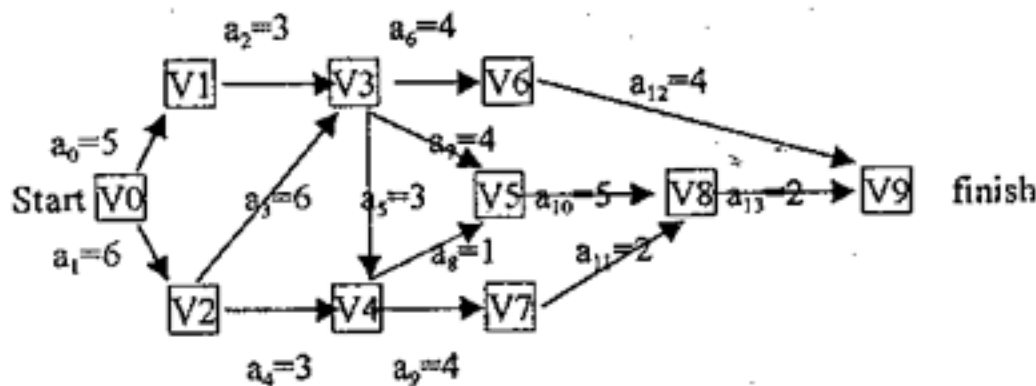
Data Structure (50%)

1.(10%) Answer the following questions.

- (a) Build a max heap using the values 10, 2, 5, 13, 8, 9, 15, 20, 7, 18.
- (b) Draw the new min heap after the deletion of value 2 in the following heap. You have to give the steps how you approach the resulting heap.



2.(25%)



For the AOE (activity on edge) network shown above, do the following.

- (a) Compute the early starting time for each activity.
- (b) Compute the late starting time for each activity.
- (c) Determine the critical path of the project.

3.(15%) Suppose that you were a smart computer scientist and one day you invented B-tree (for the purpose of this question, let us assume that B-tree was invented by you). So you are very clear in your mind how B-tree functions. Now you want to give a very formal definition about the B-tree you invented so that people who never learned B-tree can get a clear picture about it. How would you define B-tree?

Write it down clearly and formally. The score you will obtain depends on the logic and correctness of your definition.

ALGORITHM (50%)

1. Suppose the worst case of a sort algorithm is that it needs the maximum number of data exchange. Give the numbers from 1 to 10, what conditions are the worst cases when we use bubble sort, quick sort, radix exchange sort and heap sort. Also prove your answers. (20%)
2. Please write Knuth-Morris-Pratt algorithm and Boyer-Moore algorithm to solve the string matching problem? Also discuss the time complexity of both algorithms. (15%)
3. There is a decimal number containing some digits. Please propose an algorithm to form two numbers, in such a way that the difference of the two newly formed numbers be minimal. Each digit of the original number should be used only once. The digits may be equal. For example, the digits are 5, 5, 1, 3, 4, 9, your algorithm shall output 539 and 541. The difference is 2, which is the minimal difference between any two formed numbers. (15%)