EEN218
Third Happy Little Testette
30th November 2010

You know the rules.

Who are you ? _____

What is your student number? _____

"I have neither given nor accepted any aid in this examination": Sign

_____

Make no marks in these boxes			
Question	8	9	10
Value	49%	49%	2%
Score			

8.

The following struct is used to represent magnetic animals

```
struct manimal
{ string name, species;
  int weight;

  manimal(string n, string s, int w)
  { name=n; species=s; weight=w; } };
```

Magnetic animals are to be stored in a Binary Tree, ordered by their names.

A.

Define the necessary struct(s) together with an `add` method, so that this sample code would correctly build a tree containing six animals:

```
ManiTree zoo;
zoo.add(new manimal("Lenny", "lion", 320));
zoo.add(new manimal("Sammy", "seal", 135));
zoo.add(new manimal("Quacky, "puppy-eating duck", 5));
zoo.add(new manimal("Timmy", "tiger", 251));
zoo.add(new manimal("Rosie", "pony", 260));
zoo.add(new manimal("Geoffrey", "georaffe", 1326));
```

B.

Draw the tree, showing nodes connected by pointers, as it would be directly after the sample code is executed.

C.

Add a method to the tree-of-animals class. It should take an animal's name as its parameter, and return as its result that animal's weight, or -999 if there is no match. Your method should not print the result itself, just return it. So

```
int w = zoo.weightof("Timmy");
cout << "Timmy weighs " << w << " pounds";
```

should print

```
Timmy weighs 251 pounds
```

9.

Show your reasoning, use human-oriented units such as hours, months, or years rather than enormous numbers of seconds. State any assumptions that you make in answering these questions.

A.

Using the O(...) notation, and N to represent the number of data items involved, what is the speed of:

i. Insertion sort

ii. Merge sort

iii. Bubble sort

iv. Binary Chop Search

v. Searching a Linked List

vi. Searching a well balanced Binary Tree

B.

If an implementation of Insertion Sort on a particular computer is found to take 1,000 seconds to sort 1,000,000 items:

i. How long would you expect it to take to sort 3,000,000 items?

ii. How long would you expect it to take to sort 1,000 items?

iii. How long would you expect it to take to sort 1,000,000 items?

iv. How long would you expect it to take to sort 1,000,000,000 items?

C.

If it takes one tenth of a second to search a linked list of 1,000,000 items, and those items were then put into a binary tree, how long would you expect a search of that tree to take?

D.

If it takes Bubble Sort an hour to sort an array of 1,000,000 items,

i. How long would it take for a Binary Chop Search to find an item in the resulting sorted array?

ii. How long would it have taken to sort the array if Merge Sort had been used instead of Bubble Sort?

E.

You may not have heard of “Boolean Satisfiability”, but its speed is $O(2^n)$. That is, Exponential.

If it takes Boolean Satisfiability 1mS for 10 items, how long would it take for 100 items?

10.

What is the difference between a crocodile and an alligator?

a. one is bigger than the other
b. they are both the same size
c. crocodiles do not like potatoes
d. because one back leg was both the same
e. none of the above

Who discovered Christopher Columbus?

a. America
b. a Western route to India
c. Viking settlers
d. Magellan
e. Vasco da Gama

When was 1815?

a. the battle of Waterloo
b. Napoleon
c. 1776
d. the battle of New Orleans
e. Belgium

Where do hippopotamusses generally build their nests?

a. in mighty oak trees
b. like an allegory on the banks of the Nile
c. where angels fear to tread
d. in the ashes of broken dreams
e. illustrate your answer with an illustration