

# EEN318

## Friendly Gentle Test

### 61st September 2013

Behave nicely and do as you're told

Who are you ?

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What is your student number?

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

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do not write anything below that line.

Question	1	2	3	4
Value	33%	33%	33%	1%
Score				

1.

Here is part of the definition of a hash table for storing the addresses of a lot of people. Given a person's name, it should be able to find their address very quickly. The notation "... .." means that I might have left something out.

```
class hash_table
{ protected:

    struct hash_entry
    { string name, address;
      hash_entry * next;
      ... .. };                                // point 1

    int size;
    hash_entry * * table;
    ... ..                                    // point 2

public:

    hash_table(int initial_size = 100)
    { size = initial_size;
      table = new hash_entry * [size];
      ... .. }                                // point 3

    int hash(string s)
    { ... .. }                                // point 4

    void add_new_entry(string nm, string addr)
    { int pos = hash(nm) % size;
      hash_entry * e = new hash_entry(nm, addr);
      ... ..                                    // point 5
      double fullness = ... ..                 // point 6
      if (fullness > 0.5)
          resize_table(size*2);
      ... .. }                                // point 7

    void resize_table(int newsize)
    { ... .. }                                // point 8

    ... .. };                                // point 9
```

Write the parts that I left out, at points 1 to 9.

You do not need to write the method that performs searches, we'll just pretend it's there, but thinking about it might help you to get `add_new_entry` right.



2.

A.

In Quick-sort, what is meant by the terms “partition” and “pivot”?

B.

Explain what can go wrong if the pivot is chosen poorly?

C.

Describe two methods for choosing a pivot that are likely to avoid these problems.

D.

Write C++ code that will perform the partition operation when an array of doubles is being sorted.

E.

Give a simple explanation of your answer to part D in plain English. It must be complete enough that a person who knows what partitioning is supposed to do but doesn't know how it works, would be completely convinced that it is correct.



3.

A binary file called `astro.dat` contains a large number of records of astronomical discoveries. Each record has exactly the same format, and consists of:

1. an int that indicates which astronomer made the discovery (they all have serial numbers), followed by
2. an int that indicates which observatory they were working in (observatories have serial numbers too), followed by
3. a double that records (in miles) how far away the discovery is from the earth, followed by
4. a string of 16 ascii characters showing the name of the discovery.

This file is to be processed to create another file called `obs173.dat`. The new file is to have exactly the same format as the original file, and should contain a copy of all the records from the original file that refer to observatory number 173. But in this new file the discovery names should be converted to all capital letters.

Write a complete program that performs this task.

Do not use the C++ `<fstream>` library, use `<stdio.h>` instead.



4.

Draw a picture of an elephant.