University of Swaziland
Department Of Computer Science
Supplementary Examination
July 2008

Title of paper: *C under Unix*

Course number: *CS344*

Time Allowed: *Three (3) hours*

Instructions:

- *Answer questions 1 and 2.*
- *Answer any other two (2) questions from questions 3 to 6*
- *Each question carries 25 marks*

This paper may not be opened until permission has been granted by the invigilator

Question 1-25 marks
(Compulsory)

(a) Fill in the blanks in the following. (**Note** : *Just write down the missing words*) *15 marks*

(i) Class members are accessed through the _____ operator in conjunction with the name of an object of the class or via the _____ operator in conjunction with a pointer to an object of the class.

(ii) Members of a class specified as ____ are accessible only to member functions of the class and to derived class.

(iii) Member functions of a class are normally made _____ and data members are normally made _____.

(iv) A ____ is a special member function used to destroy objects of a class.

(v) An object's member functions have access to a "self pointer" to the object called the ____ pointer.

(vi) If class **Alpha** inherits from class **Beta**, then class **Alpha** is called the _____ class and **Beta** is called the _____ class.

(vii) A pure virtual function is specified by placing _____ at the end of its prototype in the class definition.

(viii) A class definition that contains at least one or more pure virtual functions is called an _____ class.

(ix) Templates enable us to specify, with a single code segment, an entire range of related functions called _____, or a entire range of related classes called _____.

(x) A pointer is a variable that contains as its value the _____ of another variable.

(xi) In C++, it is possible to redefine a function in a derived class using the same and same signature. This is called _____.

(b) State whether the following statements are true or false. If False explain why it is false. *10 marks*

(i) Integer variables need not be declared before they are used.

(ii) Variable declaration may appear almost anywhere in the body of a C++ function.

(iii) A C++ program that prints three (3) lines of output must contain three (3) output statements using **cout**.

(iv) An array can store many different types of values.

(v) Private members are visible to friends of a class.

(vi) If **class A** is a friend of **class B**, this implies **class B** is a friend of **class A**.

(vii) An object is an instance of a class.

(viii) The name of an array is a constant pointer to the first element of the array.

(ix) The extraction operator (>>) can be overloaded.

(x) A function template provides overloaded template functions

Question 2-25 marks
(Compulsory)

Translate the following Pascal program into an equivalent C++ program.

```
program Stats (Infile);
var InFile : Text;
    Char_count, Vowel_count, Line_count : Integer;
    ch : char;
begin
     Char_count := 0;
     Vowel_Count := 0;
     Line_Count := 0;

     Assign (Infile, 'letter.txt');
     Reset (InFile);

     while not eof (InFile) do
     begin
       while not eoln (InFile) do
       begin
         read (InFile, ch);
         char_count := char_count + 1;
         if ch in ['a','e', 'i', 'o', 'u','A','E', 'I', 'O', 'U'] then
               Vowel_count := Vowel_count + 1;
        end;
        Line_count := Line_count + 1;
        readln (Infile);
     end;
     close (InFile);
     writeln ('Number of characters = ', Char_count:5);
     writeln ('Number of Vowels     = ', Vowel_count:5);
     writeln ('Number of lines      = ', Line_count:5);

     readln;

end.
```

Question 3-25 marks

(a) Using a function template, write a function **Min** that takes two values and returns the largest value. *5 marks*

(b) Write a function **QualityPoints** that takes an student's average and and returns 4 if average is 90-100, 3 if average is 80-89, 2 if average is 70-79, 1 if average is 60-69 and 0 if average is lower than 60. *10 marks*

(c) Write a recursive Power function that computes and returns the value of X^n.

$$X^n = \begin{cases} 1 & \text{if } n = 0; \\ X * X^{n-1} & \text{if } n > 0; \end{cases}$$

10 marks

Question 4-25 marks

A parking garage charges E2.00 minimum fee to park for up to three hours. The garage charges an additional E0.50 per hour for each hour or *part thereof* in excess of the three hours. The maximum charges for any given 24-hour period is E10.00. Assume that no car parks for longer than 24 hours at a time. Write a program that calculates and prints the parking charges of several customers who parked their cars in the garage yesterday. You should enter the hours parked for each customer. Your program should print the results in a neat tabular format and should calculate and prints the total of yesterday's receipts. The program should use the function **CalculateCharges** to determine the charge for each customer. Your outputs should appear in the following format. (***Hint: Use an array to store the hours before printing***)

Car	Hours	Charge
1	1.5	E2.0
2	4.0	E2.50
3	24.0	E10.0
TOTAL	29.5	E14.50

Show all your working from analysis to design and implementation.

Question 5– 25 marks

(a) Define a name structure containing a string field for a **name**, an integer for **feet**, and another integer for **arms**. *5 marks*

(b) Use the new structure to define an array of 6 items of the structure defined in (a) above. *5 marks*

(c) Write a function that will print out all the data in the array declared above in the following format (*assuming appropriate assignments for, **name, feet and arms**, have been made for each data item in the array*).

```
A Human being has 2 legs and 2 arms
A dog has 4 legs and 0 arms
```

7 marks

(d) Write code segments to illustrate how these values (human being, 2, 2) would have been assigned to the corresponding variables by using a loop that reads all corresponding values (name, feet and arms) from standard input.

8 marks

Question 6– 25 marks

Write a C++ function **DoubleSpace** *(ifstream InFile, ofstream OutFile)* that takes an input stream, *InFile*, as input and copies all the contents of InFile to an output stream, *OutFile*. The lines in OutFile must be double-spaced. That is there must be at least one blank line between any consecutive lines in OutFile. The figure below shows a sample InFile and the expected double spaced OutFile.

InFile – *Single Spaced*

Good Hamlet,
Cast thy nited color
And look like a friend to Denmark

OutFile – *double spaced*

Good Hamlet,

Cast thy nited color

And look like a friend to Denmark