

University of Swaziland  
Department Of Computer Science  
Supplementary Examination  
July 2015

***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 5*
- *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]

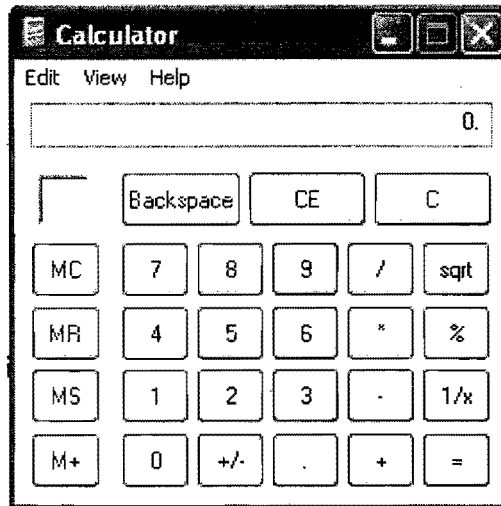
- (i) Class members are accessed through the \_\_\_\_\_ operator in conjunction with the name of an object of the class.
- (ii) Members of a class specified as \_\_\_\_\_ are accessible only to member functions of the class and to derived class.
- (iii) Member functions of a class are normally made \_\_\_\_\_ and data members are normally made \_\_\_\_\_.
- (iv) A \_\_\_\_\_ is a special member function used to destroy objects of a class.
- (v) If class **Alpha** inherits from class **Beta**, then class **Alpha** is called the \_\_\_\_\_ class and **Beta** is called the \_\_\_\_\_ class.
- (vi) In C++, a class definition that contains at least one or more pure virtual functions is called an \_\_\_\_\_ class.
- (vii) 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 \_\_\_\_\_.
- (viii) A pointer is a variable that contains as its value the \_\_\_\_\_ of another variable.
- (ix) 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]

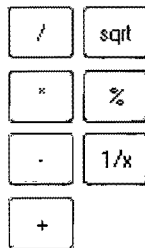
- (i) Integer variables need not be declared before they are used.
- (ii) Variable declaration may appear almost anywhere in the body of a C++ function.
- (iii) A C++ program that prints three (3) lines of output must contain three (3) output statements using **cout**.
- (iv) An array can store many 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)**

Consider the following calculator user interface.



- (a) Using UML notation draw a general human-interaction component (HIC) class diagram for this user interface. [10]
- (b) Re-draw the HIC class diagram to indicate how the interface could be implemented in C++ or C# or Java. [5]
- (c) Using UML notation, draw a problem domain component (PDC) for the Calculator application showing a single class called **Integer** with member functions to implement all arithmetic operations shown on the interface. [5]



- (d) Using pseudocode, describe the event handler for the addition (+) operation assuming intermediate operands are stored in a stack. [You may use the library or collection classes in C++/C#/Java. ] [5]

### Question 3-25 marks

Using C++ or C# or Java notation,

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

(b) Write a function **QualityPoints** that takes an student's average 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]

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

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

[10]

### 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. You may use the C++/Java/ C# library/collection classes. [25]

**Question 5– 25 marks**

- (a) Using C++/Java/C# notation, define a class containing a string field for a **name**, an integer for **feet**, and another integer for **arms**. [5]
- (b) Using the class definition in (a), define an array of 6 items of the structure defined in (a) above. [5]
- (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]
- (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]