

University of Swaziland
Department Of Computer Science
Main Examination December 2016

Title of paper : **C under Linux**

Course number : **CS344**

Time Allowed : **Three (3) hours**

Instructions:

- **Answer ALL Questions in section A.**
- **Answer any three (3) questions in section B.**

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

Section A

QUESTION 1 [25 marks]

- i. Fill in the blanks in the following (Note: Just write down the missing words) [15]
- a) Behavior is something a real-world _____ does in response to some stimulus.
 - b) Data encapsulation and data hiding are _____ in the description of object-oriented languages.
 - c) A class is a description of number of _____.
 - d) A program statement that invokes a function is a function _____.
 - e) The only technical difference between structures and classes in C++ is that _____.
 - f) Any arrangement of variables, constants and operators that specifies a computation is call an _____.
 - g) A constructor is executed automatically when an object is _____.
 - h) The expression `102%9` evaluates to _____.
 - i) The for loop is appropriate when you know in advance how many times the loop will be _____.
 - j) Pointers are useful for referring to a memory address that has no _____.
 - k) The result is a logical or Boolean value, which is _____ or _____.
- ii. State whether the following statements are true or false. If false explain why it is false. [5]
- a) The increment expression in a for loop can decrement the loop variable.
 - b) A structure definition creates space in memory for a variable.
 - c) If you declare a const object, it can only be used with const member functions.
 - d) An overloaded operator always requires one less argument than its number of operands.
 - e) Adding a derived class to a base class requires fundamental changes to the base class.
- iii. Explain the following terms: [10]
- a) Function Overloading
 - b) Single and multiple inheritance
 - c) Function and inline function
 - d) Constructor and destructor
 - e) Polymorphism and Encapsulation

Section B

QUESTION 2 [25 marks]

- i. a) Why do we need of Object-oriented programming? Explain the difference between Structured and Object-oriented programming language. [6]
- b) What do you mean by nested structures? How can you initialize Structure members, explain with a suitable program. [4]
- ii. What do you mean by Static Class Data? Show the output of the below program. [7]

```
#include <iostream>
using namespace std;

class foo
{
    private:
        static int count;

    public:
        foo()
            { count++; }
        int getcount()
            { return count; }
};

int foo::count = 0;

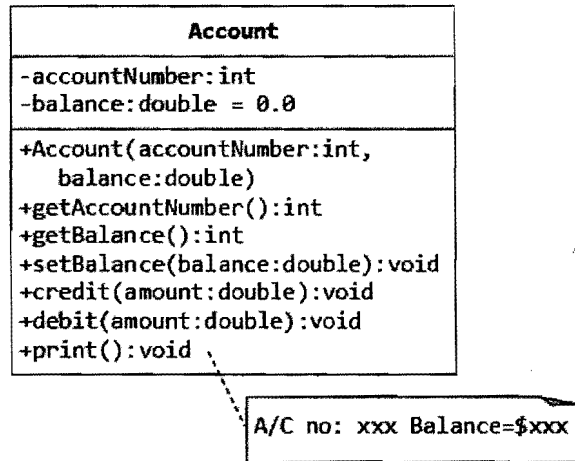
int main()
{
    foo f1, f2, f3;
    cout << "count is " << f1.getcount() << endl;
    cout << "count is " << f2.getcount() << endl;
    cout << "count is " << f3.getcount() << endl;
    return 0;
}
```

If **count** is an ordinary automatic variable then show the output of the above program.

- iii. How can arrays be used as Class Member Data, explain with a suitable C++ program. [8]

QUESTION 3 [25 marks]

- i. What is Object-oriented Programming? Briefly describe the four (4) major Principals of Object-oriented programming. [10]
- ii. A class called Account, which models a bank account, is designed as shown in the class diagram. [15]



It contains:

- Two private data members: accountNumber (int) and balance (double), which maintains the current account balance.
- Public functions credit() and debit(), which adds or subtracts the given amount from the balance, respectively. The debit() function shall print "amount withdrawn exceeds the current balance!" if amount is more than balance.
- A public function print(), which shall print "A/C no: xxx Balance=xxx" (e.g., A/C no: 991234 Balance=\$88.88), with balance rounded to two decimal places.

Using C++ notation write the complete program as described in above.

QUESTION 4 [25 marks]

- i. What is multidimensional array? Explain with a suitable example how can an array be a class member data? [8]
- ii. Here are two declarators that describe ways to add two string objects: [5]

```
void add(String s1, String s2)
String operator + (String s)
```

Match the following from the first declarator with the appropriate selection from the second:

function name (add) matches _____.

return value (type void) matches _____.

first argument (s1) matches _____.

second argument (s2) matches _____.

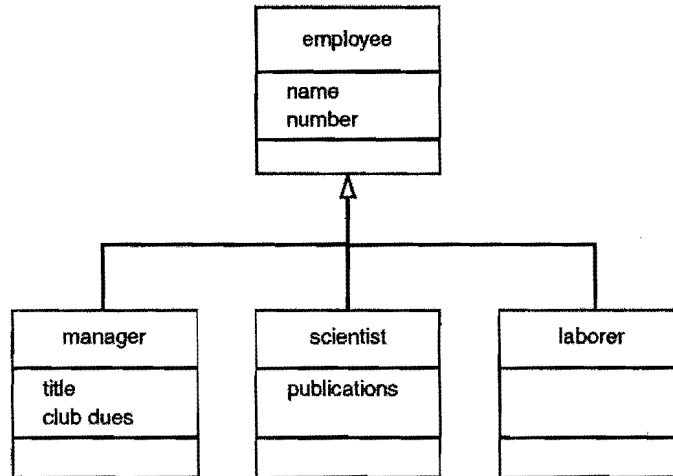
object of which function is a member matches _____.

- a. argument (s)
- b. object of which operator is a member
- c. operator (+)
- d. return value (type String)
- e. no match for this item

- iii. What is operator overloading? Discuss with an appropriate C++ program about overloaded ++ operator in both prefix and postfix. [12]

QUESTION 5 [25 marks]

- i. What is Inheritance in OOP? Discuss about Multiple Inheritance with a UML class diagram [4]
- ii. Consider the following UML class hierarchy diagram for Widget Company. [12]



Using C++ notation implement the above class hierarchy. Your implementation must be as close as possible to the above design. A sample output after insertion of data is:

Data on manager 1:

Name: Dlamini
Number: 10
Title: President
Golf club dues: 5000

Data on Laborer 1:

Name: Sifiso
Number: 201

- iii. What does aggregation mean in OOP? Write a C++ program demonstrating the use of the overloading functions in the base and derived classes. [9]

End of Question Paper