



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST SEMESTER EXAMINATION FOR DEGREE IN BACHELOR OF SCIENCE IN
MATHEMATICS AND COMPUTING

SMA 391: OBJECT ORIENTED PROGRAMMING

Date: 10/8/2016

Time: 8:30 – 10:30 AM

INSTRUCTIONS

This paper consists of FIVE questions

Answer question ONE and other TWO questions in this paper.

QUESTION ONE (30 MARKS) (COMPULSORY)

(a) Explain the relationship between **a class** and **an object** (4 marks)

(b) An access specifier is one of the following keywords: private, public, or protected. Explain the meaning of these words (6 marks)

(c) Consider the following class declarations in C++:

```
class C {  
    protected : int x;  
  
    Public : void f() {...};  
};  
class C1 : public C {  
    protected : int x1;  
    public: void (C*obj){...};  
};  
  
class C2: public C1 {  
    Public: int x2;  
};  
class C3: public C {  
    public:f(){...};  
};
```

(i) Draw the class hierarchy (2 marks)

(ii) Assume that main () contains the following declaration:

C1 obj1

For each of the following expressions , say whether it is allowed in the code of main or not giving reasons as to why or why not (they can be forbidden either because they violate the class definition or the protection mechanism)

Obj1 .x, obj1 .f(), obj1.x1, obj1.x2 (8 marks)

(d) Differentiate between *constructor* and *destructor* (4 marks)

(e) Explain the following types of Member functions of a class; Static functions, Const functions, and Friend functions.. (6 marks)

QUESTION TWO (20 MARKS)

(a) Explain the difference between *single inheritance* and *multiple inheritance*. (4 marks)

(b) Outline the general syntax of a derived class (6 marks)

(c) Outline how a member function can be made a friend function with an aid of an example. (4 marks)

(d) Explain the following statements as used when using functions:

(i) Call by Reference (2 marks)

(ii) Call by value (2 marks)

(iii) Inline function (2 marks)

QUESTION THREE (20 MARKS)

(a) Write a program that presents a class called GradeBook with one member function that displays a welcome message when it is called. Create an object of that class and call the member function so that it displays the welcome message. (10 marks)

(b) Consider the following template definition in C++:

```
template < class T > class cell {  
protected:  
    T info;  
public:  
    void set(T x){ info = x; }  
    T get() { return info; }  
};
```

Define the subclass *colored_cell* by extending the class *cell* with:

- A field *color*, indicating the color of the cell, represented as a character (“W” for white, “b” for black, “r” for red, ect.)
- The method *set_color*, which set the content of the field *color*,
- The method *get_color*, which returns the content of the field *color*, and
- an update method *get*, which returns the content of the field *info* if the color is not white, and returns 0 otherwise .

(10 marks)

QUESTION FOUR [20 MARKS]

(a) Examine the following section of C++ code that has several errors and omissions:

<pre>#include<iostream.h> class account { private float balance; Int actNum; }; class Deposit: public Account { private: float interestRate; public: Deposit (foat,int, float); Virtual void display (); } Deposit:: Deposit (float aBalance,int anAccNum, float iRate) {</pre>	<pre>balane=aBalance; actNum=anAccNum; interestRate=iRate; } deposit:diplay() { cout<<"Balane is" << balanne << endl; cout<<"Act Num is" <<actNum<< cout<<"Interest Rate is" <<interestRate <<endl; } void main (void); { Deposit d (10.0f, 12345), d.display(); deposit *p=d; p->display(); }</pre>
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Locate the errors in the code and explain why you believe there is an error at that location.

(12 marks)

(b) Explain the following concepts of OOP.

(8 marks)

- (i) Abstraction
- (ii) Encapsulation
- (iii) Inheritance
- (iv) Polymorphism

QUESTION FIVE (20 MARKS)

- (a) With aid of example, outline the opening of a file using a constructor function (4 marks)
- (b) Outline rules for method overriding in object oriented programming. (4 marks)
- (c) Write a C++ Program to Define a Class Student with the following specification and accessing member function using its object. (12 marks)

Private members of class student

admno integer

sname 20 character

eng, math, science float

total float

ctotal() a function to calculate eng + math + science with float return type.

Public member function of class student

Takedata() Function to accept values for admno, sname, eng, science and invoke ctotal() to calculate total.

Showdata() Function to display all the data members on the screen.