KASNEB

CICT PART II SECTION 4

OBJECT ORIENTED PROGRAMMING

PILOT PAPER

September 2015. **Time Allowed: 3 hours.**

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

ALL programs written should be in an object oriented programming language (C++, Java, VB.Net).

QUESTION ONE

(a) Define the following terminologies as used in programming:

(i) Object oriented programming. (2 marks)

(ii) Procedural languages. (2 marks)

(b) Distinguish between the following terms in the context of object oriented programming:

(i) "Overloading" and "overriding". (4 marks)

(ii) "Polymorphism" and "encapsulation". (4 marks)

(c) Given the UML class diagram of the class of a rectangle, answer the questions that follow:

Rectangle
- Length : double - Width : double
x Rectangle ( ) x Rectangle (double, double) x setDimensions (double, double) : void x getLength ( ) : double x area ( ) : double x perimeter ( ) : double x toString ( ) : String

(i) Write a method that returns the area. (2 marks)

(ii) Write a method that returns perimeter. (2 marks)

(iii) Write the getter methods for the length and width. (2 marks)

(d) Interpret the result of the short-circuit evaluation of the following expression with an explanation:
(14>=5) & ('A' < 'B') (2 marks)

(Total: 20 marks)

QUESTION TWO

(a) Explain the following terminologies as used in object oriented programming:

(i) Constructor. (2 marks)

(ii) Default constructor. (2 marks)

(b) Differentiate between "shallow" and "deep" copying as used in constructors. (4 marks)

(c) An examinations body's community is made up of employees, students and alumni (graduates). The employees are either permanent or temporary. Temporary employees can also be students.

Required:

(i) Illustrate the IS–A relationship of the scenario using a simple hierarchy diagram to represent the UML class diagram. (2 marks)

(ii) Show by labelling the single and multiple inheritance from the diagram. (2 marks)

(iii) Distinguish between "single" and "multiple" inheritance as used in object oriented programming. (4 marks)

(d) (i) Consider the following code sample and examine the results after execution. (2 marks)

```
if ( . . . ) {
    int  i = 7 ;
    . . .
}
System.out.println ("The value of i = " + i ) ;
```

(ii) Write the output of the following code segment:

```
int  x = 1 ;
while (x < 5) {
    System.out.println (x) ;
    if   (x  = = 3)
        x++ ;
    else
        x = x + 2 ;
    }
```

(2 marks)

(Total: 20 marks)

QUESTION THREE

(a) During object oriented programming execution, exceptions occur.

Describe the following terms as used in exception handling:

(i) Try block. (2 marks)

(ii) Catch block. (2 marks)

(b) (i) Illustrate the Try\catch\finally block with a general syntax. (3 marks)

(ii) Justify the essence of memory management in object oriented programming. (2 marks)

(c) (i) If x and y are variables of type double, write an object oriented code for the mathematical expression.

$$\frac{x^2 + 2}{3y - 5}$$

(2 marks)

(ii) Explain the statements below:

```
int die 1 ;
die1 = (int) (Math.random ( ) * 6) + 1 ;
```

(2 marks)

(iii) Compute the expression 15% 2 + 10, showing your working. (2 marks)

(d) (i) Distinguish between private and protected access modifiers. (4 marks)

(ii) Define a package as used in object oriented programming. (1 mark)

(Total: 20 marks)

QUESTION FOUR

(a) (i) Define the terminology "binding" as used in object oriented programming. (2 marks)

(ii) Distinguish between "static" and "dynamic" binding as used in functions. (4 marks)

(iii) Explain what is a method declaration. (2 marks)

(iv) Illustrate a simple method declaration as used in object oriented programming. (2 marks)

(b) (i) Rewrite the following program statement using the ternary operator:

```
if (n < 5) {
   var = 20 ;
   } else {
     var = 77 ;
   }
```

(2 marks)

(ii) Using the statement in b (i) above write a complete object oriented program displaying the output. (4 marks)

(c) Differentiate between the UpperCase ( ) and LowerCase ( ) methods used in object oriented programming. (4 marks)

(Total: 20 marks)

QUESTION FIVE

(a) Distinguish between the following terminologies as used in object oriented programming:

(i) "Process-based" and "thread based" multitasking. (4 marks)

(ii) A "template" and a "class". (4 marks)

(b) Explain the meaning of the following terminologies as used in object oriented programming:

(i) Memory leak. (2 marks)

(ii) Stack. (2 marks)

(c) Write program statements to perform the following tasks:

(i) Dynamically allocate a memory. (2 marks)

(ii) Free the dynamically allocated memory in c(i). (2 marks)

(d) Interpret the result of the following statements with a reason:

(i)
```
byte b = 1 ;
byte b2 = b + 1 ;
```

(2 marks)

(ii) int [ ] a, b, c ; (2 marks)

(Total: 20 marks)

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