THE OPEN UNIVERSITY OF SRI LANKA
B.Sc DEGREE PROGRAMME: LEVEL 05
OPEN BOOK TEST: 2010
CSU3279: OBJECT ORIENTED PROGRAMMING
DURATION: ONE AND HALF HOURS (1 ½ HOURS)

Date: 03rd September, 2010 Time: 4.00 pm – 5.30 pm

Answer ALL questions.

QUESTION 1

a) State whether the following statements are **True** or **False** and briefly explain how you arrived to your conclusion.

i. *4EverLove* is an invalid C++ variable name.
ii. C++ is a pure object-oriented programming language.
iii. A C++ array stores array elements in different locations in the main memory.
iv. A C++ string can manipulate as an array.
v. There is no difference between prefix and postfix versions of increment operator in C++.

b) What data types would you use to represent the following items? Briefly explain why you have selected a specific data type for each item.

i. Average age of a student group
ii. Sex of a person
iii. Avogadro's number (6.0221415×10^{23})
iv. Salary of an employee
v. Name of a bird
vi. Population of Sri Lanka

c) Write C++ expressions for the following mathematical formulae. Avoid writing unnecessary parentheses.

i. $\frac{x+y}{3}$

ii. $\sin^2\theta + \cos^2\theta$

iii. $C\left(1+\frac{r}{n}\right)^{nt}$

iv. $\frac{-1}{|x|\sqrt{x^2-1}}$

v. $\frac{4}{3}\pi r_1 r_2 r_3$

QUESTION 2

a) Determine the value of each of the following. Write your steps clearly.

i. 8 * 9 / 3
ii. 5 / 2 * 25
iii. 2 < 3 + 5 * 6! = 0
iv. 35 && 2 == 3 || 4! = 0
v. ! 35 – 6 * 6 / 4 ++

b) Explain the following types of errors in a computer program.

i. Syntax errors
ii. Logical errors
iii. Run-time errors

c) Determine the errors in the following incorrect program and identify them as one of the errors explained in part b).

Description of the program

The acceleration of a sleigh sliding down a hill is a = g sin θ, where θ is the slope of the hill, and the gravity acceleration g = 9.8 ms^{-2}. This C++ program reads the slope (in degrees) and the height (in meters) of a hill as inputs, and calculates how long it takes to slide down the hill.

[*Hint: Time:* $t = \sqrt{\frac{2h}{g \sin^2 \theta}}$ *where h is the height of the hill*]

Incorrect Program

```
#include <iostream>

using namespace std;

const Float g = 9.7;
const float PI = 3.142;

int main()
{
    float teta, height:
    float t;
    cout >> 'Slope of the hill (in degrees)= ';
    cin >> teta ;
    cout << "Height of the hill (in meters)= ";
    cin >> hieght;
    t = 2*height/g*sin(teta);
    cout << "Time to slide down the hill = " << t << "s" << "\n";
    return (EXIT_SUCCESS);
}
```

QUESTION 3

a) What are the advantages of using functions to modularize a program?

b) What are the differences between passing a parameter by value and by reference?

c) Construct function prototypes that match the following descriptions:

i. salt() takes no arguments and returns a double value.
ii. square() takes one integer variable and returns the square of the integer variable.
iii. swap() takes two integer variables and interchanges the values of those two variables.
iv. sulee() takes two float variables x and y and changes the value of y as x + y.
v. batsmanAvg() takes scores of cricket matches played by a batsman and returns his batting average.

d) Monthly installment of a loan is computed as:

$$\frac{r(1+r)^n P}{(1+r)^n - 1}$$

Where, P – Principal loan amount, r – monthly interest rate and n – number of monthly installments of the loan. Write a C++ program to obtain the monthly installment of a loan given that principal loan amount, annual interest rate and number of years of the loan as inputs.

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CLOSED BOOK TEST: 2010/2011
CSU 3279: OBJECT ORIENTED PROGRAMMING
DURATION: **ONE AND HALF HOURS** (1 ½ HOURS)

Date: 07th October, 2010 Time: 4.00 pm – 5.30 pm

Answer ALL questions.

Q1.

a) What are the advantages of using object-oriented programming over procedure-oriented programming?

b) Briefly explain the following terms in object-oriented programming:

i. Abstraction
ii. Inheritance
iii. Polymorphism

c) Give an example to describe the relationship between a class and an object.

d) What is a friend function?

e) Explain the role of '`this`' pointer in a class.

Q2.

a) What C++ data type would you use to represent the civil status of a person with the possible values `Single`, `Married`, `Divorced`, `Living Together`, and `Separated`?

b) Explain the following C++ statements:

```
double x = 2.5;
double &y = x;
double *ptr = &y;
cout << *ptr << "\n";
```

c) Write C++ codes to print the following pattern using `for` loops. **Do not** use any formatting commands/manipulators with `cout`.

```
        *
      * *
    * * *
  * * * *
* * * * *
```

d)

i. Write three advantages of using functions in a C++ program.

ii. Write a C++ function to obtain the average of an array of `floats`.

iii. Write C++ statement(s) to obtain the average of the following array using the function defined in part (ii).

```
float marks [] = {45, 55, 60};
```

e)

i. Write a structure template (named Money) to represent the amount of Sri Lankan currency. It is required to store rupees and cents separately.

ii. Write C++ functions to implement the following using the structure template defined in part (i).

a. To add two amounts. e.g., Rs. 5.75 + Rs. 6.50 = Rs. 12.25

b. To subtract two amounts. e.g., Rs. 7.50 – Rs. 5.75 = Rs. 1.75

c. To multiply an amount by a scalar. e.g., 5 * Rs.5.75 = Rs. 28.75

iii. Write C++ statement(s) to do the following using the functions defined in part (ii).

a. Nimal has 10 rupees and 50 cents and Kamal has 13 rupees and 65 cents. To obtain the total amount of money both Nimal and Kamal have.

b. Saman wants to buy two shirts and each shirt worth Rs. 599.99. He has Rs. 2000/- in his wallet. To obtain the balance amount after buying the two shirts.

Q3.

a) Define a C++ class (named `Circle`) to represent a circle that includes the following data members.

- Radius of the circle
- x and y coordinates of the circle's center

b) Include the following member functions to the `Circle` class.

i. A default constructor to create a circle with radius 1 and the center of the circle is located on the origin.

ii. A parameterized constructor to initialize data members of the class.

iii. To return the area of the circle πr^2 where `r` is the radius of the circle.

iv. To display the data members of the class.

c) Write a main program to test your class.