

**UNIVERSITY OF SWAZILAND  
FINAL EXAMINATION MAY, 2016 (SEM-II)**

**Title of Paper : COMPUTER PROGRAMMING - I**

**Course number : CSC 112**

**Time allowed : Three (3) hours.**

- Instructions :**
- (1) Read all the questions in Section-A and Section-B from page 1 to page 5.**
  - (2) Answer all questions in Section-A. Choose options as given in questions of Section-B.**
  - (3) Maximum mark is 100.**
  - (4) Use correct notations and show all your work on the script.**
  - (5). All programs should be well documented and indented.**

**This paper should not be opened until the invigilator has granted permission.**

## SECTION-A

**Q1(a). (10 marks).** Write equivalent single assignment statements corresponding to each of the following mathematical relations to find numerical values of S, P, R, *root1* and the derivative  $dT/d\theta$ . Use suitable correct identifiers.

$$1. S = \frac{a^2 - b^2}{3abc(3ac - 2bc)}$$

$$2. P = \sqrt{\frac{(2 - 3\alpha^2)(3 - 2\beta^2)}{(1 - 6\alpha^2\beta^2)(\alpha - \beta)}}$$

$$3. \frac{1}{R} = \frac{1}{R1} + \frac{1}{R2}$$

$$4. \text{root1} = \sqrt{\frac{-b + (b^2 - 4ac)}{2a}}$$

$$5. \frac{dT}{d\theta} = \frac{\sin^2(\theta)}{1 + \sin(2\theta)}$$

**Q1(b). (10 marks).** Find the values of left hand side identifiers in the following assignment statements. Assume that the following declarations are already given. What will be the exact display on the screen when the following program segment is executed?

```
const int X = 4 , Y = 4 , A = 2, B = 7, R = 4;
int T1, T2;
bool On_Circle, Yes;
string Result, name = "DLAMINI";
```

```
On_Circle = ((X-A)*(X+A)+(Y-B)*(Y+B)) != (R*R);
Result = name + "DLAMINI";
Yes = (X*X) == (A+2*B);
T1 = (X-A)/2 + (Y+B)/2;
T2 = sqrt(X*X + Y*Y - B);
```

```
cout << " On_Line = " << On_Circle << endl
      << " Result = " << result << endl
      << " T1      = " << T1 << endl
      << " T2      = " << T2 << endl
      << " Asert   = " << Yes << endl;
```

**Q2(a). (5 + 5 + 10 marks).** Write complete function subprograms to find and return the smallest and largest value of three given floating numbers having the following headers –

float smallest (float a,b,c) \\ that returns the smallest of a, b and c

float largest (float a,b,c) \\ that returns the largest of a, b and c

Write the calling program that tests the above smallest and largest functions. The calling program should read the required data interactively, call the function subprogram and display the test data and results produced in a good layout.

**Q2(b). (10 marks).** Write the exact output produced by your programs of Q2(a) when they are executed for the following data sets

- (i)  $a = 8.0, b = 12.0, \text{ and } c = 11.0,$
- (ii)  $a = 12.0, b = 12.0 \text{ and } c = 9.0,$
- (iii)  $a = 1.0, b = 1.0 \text{ and } c = 2.0,$
- (iv)  $a = 3.0, b = 4.0 \text{ and } c = 4.0 \text{ and}$
- (v)  $a = 1.0, b = 1.0 \text{ and } c = 1.0 .$

### SECTION-B

NOTE: Select options in this section as given with the questions.

**Q3. (marks 25).** Assume that reading is from the keyboard and display is on the screen and the following declarations are already given -

```
int N1, N2, N3, N4, I, J, Temp, P[1000];
float Tax, Salary;
char Answer;
```

Write executable statements in C++ with proper syntax (not a complete program) to perform **any five** of the following tasks independently. Use the above declarations only.

(i). Circulate left once so that, the value of N2 goes to N1, N3 goes to N2, N4 goes to N3, N1 goes to N4 (i.e. values of  $N1 \leftarrow N2 \leftarrow N3 \leftarrow N4 \leftarrow N1$ ).

(ii). Compute Tax according to the following rules –

Tax is 30 % of Salary, if Salary is 100000 or more,  
Tax is 20 % of Salary, if  $60000 < \text{Salary} < 100000$  ,  
Tax is 10 % of Salary, if Salary is less than or equal to 60000 and  
There is no Tax if Salary is 36000 or less.

(iii). Using a switch statement, display 'YES', if Answer is 'Y' or 'y'.  
Display 'NO' if Answer is 'N' or 'n'.  
Display 'INCORRECT ANSWER' otherwise.

(iv). Display all the values and their count in array P, which are non zero. Assume P has 1000 values.

(v). Display the largest and smallest values in array P. Assume P has 1000 values.

(vi). Assuming P has 1000 values, display  
    'DESCENDING' only if ( $P_i \geq P_{i+1}$  for all possible i),  
    'ASCENDING' only if ( $P_i < P_{i+1}$  for all possible i).

**Q4. (marks 6 + 4 + 5).** Information about a line is known by the values of its slope (M) and intercept (C) and a point is known by its x-y coordinates. Now assume that the information about two Lines, say L1 and L2 are given and similarly information about three points, say P1, P2 and P3 are given. It is required to find out for all the points that lie on L1, L2 or both. i.e.

Given a point  $P_i$ , find out if  $P_i$  lies on L1 or  
     $P_i$  lies on L2 or  
     $P_i$  lies on both L1 and L2.

Each line is to be displayed as -  $Y = M X + C$   
Each point is to be displayed as -  $(X, Y)$ .

Write the analysis, IPO and pseudo codes to solve the above problem. Include suitable comments and proper indentations in your program.

**HINT: A point lies on a line if the point satisfies the equation of the line.**

**Q5. (10 marks).** Read the following C++ program very carefully and write the exact display produced on screen when the program is executed.

```
// Program CSC112_Exam_May_2016;

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

int main()
{
    const int Size = 5;
    int ST, TEMPST, Q, i,j,digit, count, prod;

    for (i = 1; i < Size; i++)
    {
        cout << i << " Enter value number " << endl;
        cin >> ST;
        cout << ST << endl;
        TEMPST = ST;      count = 0;      prod = 1;
        cout << "DATA  DIGIT COUNT PRODUCT" << endl;

        while (!(TEMPST == 0))
        {
            Count = count + 1;
            digit = TEMPST % 10;
            prod = prod * digit;
            cout << setw(6) << TEMPST << setw(6) << digit
                << setw(6) << count << setw(6) << prod << endl;
            TEMPST = TEMPST / 10;
        };
    };
    return 0;
}
```

Assume that the data entered at run time is :

6789  
2134  
5163  
4101

**OR**

2345  
7601  
1230  
5555

Give the exact display for either of the above input data sets.

**(End of Examination Paper)**