

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

Title of Paper :     STRUCTURED PROGRAMMING – I /  
                          COMPUTER PROGRAMMING - I

Course number :     CS243 / CSC 112

Time allowed    : Three (3) hours.

Instructions     : (1) Read all the questions in Section-A and Section-B  
                          from page 1 to page 4.

(2) Answer all questions in Section-A and 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 statement corresponding to each of the following mathematical relations to find numerical values Shaft, P, F, root1 and the derivative,  $dy/dx$  of double type. Use suitable, but meaningful correct identifiers.

1.  $Shaft = \frac{a^2 - b^2 + 33c^2}{33abc(|2a - 3b|)}$
2.  $P = \sqrt{\frac{(2\beta^2 - 3\alpha^2)(3\alpha^2 - 2\beta^2)}{(\alpha^2 - \beta^2)\sqrt{(\alpha - \beta)}}}$
3.  $\frac{1}{F} = \frac{1}{F1} + \frac{1}{F2}$
4.  $root1 = \frac{-b - \sqrt{(b^2 - 4ac)}}{2a}$
5.  $\frac{dy}{dx} = \frac{\sin^2(x) + \cos(2x)}{1 + \sin(\sqrt{x})}$

**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?

```
int T, Tr; X = 3 ; Y = 2 ; A = -2; B = 3; C = 2;
string Holi_day, examdate = " in july ";
                supldate = " in june ";
bool Off_Line;      char Comp_Ch;
```

1. `Off_Line = A * X + B * Y + C == 0;`
2. `Holi_day = examdate.substr(2,3) + supldate;`
3. `Tr = C div 3 - B mod 3 - A + 2;`
4. `Comp_Ch = 'C' + C;`
5. `T = (X-A) div 2 + (Y+B) div 3;`

```
cout << " On_Line = " << Off_line << endl
      << " Result = " << Holi_day << endl
      << " Trans = " << Tr << endl
      << " TADA = " << T << endl
      << " NEWCHAR = " << Comp_Ch << endl;
```

**Q2. (3 + 6 + 5 marks)** Write IPO, pseudo code and a complete C++ program to compute the average age and count of students in a class. The program should read the ages of students (in years, as two digit integers) from the keyboard interactively. The sentinel age should be given as a zero value. Use good interactive messages and output lay out on the screen.

**Q3(a). (4 + 2 marks).** Write two functions to convert temperature from Celsius to Fahrenheit and from Fahrenheit to Celsius as follows -

1. *Celsius\_to\_Fahrenheit* – Returns Fahrenheit (F) of any given Celsius (C) value using  $F = 5/9 * C + 32$
2. *Fahrenheit\_to\_Celsius* – Returns Celsius (C) of any given Fahrenheit (F) value using  $C = 5/9 * (F - 32)$

**Q3(b). (10 marks)** Write a main test program that interactively reads appropriate test data from the keyboard and displays test data and results of both the functions of Q3 (a) on the screen with a good layout. Comment on testing both functions by one data value.

### SECTION-B

**Q4. (24 marks)** Assume that reading is from the keyboard and display is on the screen and following declarations are already given -

```
int N1, N2, N3, N4, I, J, count;
char Answer, Grade;
float CA, EXAM_MARK, FINAL_MARK, P [1000];
```

Write only executable statements in C++ with correct syntax (not a complete program) to perform the following tasks independently. Answer any **four** of the following

- (i). Independently, exchange the values of N1 and N2 only if N3 and N4 are unequal. Also exchange the values of N3 and N4 only if N1 and N2 are equal..
- (ii). Using a case statement, display 'CORRECT', if Answer is 'C' or 'c'. Display 'INCORRECT' if the Answer is 'I' or 'i'. Display "UNABLE TO ANSWER" otherwise.
- (iii). Display all the values in P which do not lie in [-10, 10]. Assume P has 1000 values.
- (iv). Display all the negative values in array P and their count. Assume P has 1000 values.
- (v). Display 'IN ORDER' only if  $(N1 > N2 > N3 > N4)$  or  $(N1 < N2 < N3 < N4)$  is true, otherwise display 'NOT IN ORDER'

**Q5. (4 + 4 + 8 marks)** Information about several points (as xy-coordinates) is known. It is required to find out the quadrant number in which each point lies. Also the display should include the count of points lying in each quadrant. The sentinel point lies on, one or both the axis.

All the information is to be given interactively from keyboard, The xy-coordinates of points are to be displayed along with the quadrant number on the screen according to your own layout.

A point is in quadrant one if both xy-coordinates of the point are positive, it is three if both xy-coordinates are negative, it is four if x is positive and y is negative and it is two if x is negative and y is positive.

Write the IPO, pseudo code and your own test data to solve the above problem. Write the corresponding results produced when your own test data is given to your pseudo code.

**Q6. (10 marks)** Read the following C++ program very carefully and write the **exact** display produced on screen when the program is executed.

```
// Program CS243_CSC112_Exam_Dec_2016 + required includes
// <iostream> + <iomanip> + using namespace std;
int Size = 5; int ST, TEMPST, i,j,digit, counter, checksum;
int main()
{
    for (i = 1; i < Size; i++){
        cout << i << " Enter value number " << endl;
        cin >> ST;      cout << ST << endl;
        TEMPST = ST;   counter = checksum = 0;
        cout << "DATA   DIGIT COUNT   SUM" << endl;

        while (!(TEMPST == 0))      {
            counter++;
            digit = TEMPST % 10;
            checksum = checksum + digit ;
            cout << setw(6) << TEMPST << setw(6) << digit
                << setw(6) << counter << setw(6) << checksum
                << endl;
            TEMPST = TEMPST / 10;
        };
    };
    return 0;
}
```

Give the exact display when the input data is -

2660 3246 1428 2222

or

1234 1010 1111 4321

**(End of Examination Paper)**