

**UNIVERSITY OF SWAZILAND
FINAL EXAMINATION, DEC 2013 (SEM-I)**

Title of Paper : STRUCTURED PROGRAMMING - I

Course number : CS243

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) (marks 10). Write equivalent single assignment statements corresponding to each of the following mathematical relations to find S, P, R, *firstroot* and the derivative dy/dx . Use suitable identifiers.

1. $S = \frac{(a+b)(a-2bc)}{3ab^3}$
2. $P = \sqrt{\frac{(2\alpha - 3\beta)(3\alpha - 2\beta)}{(1 - 6\alpha\beta)}}$
3. $\frac{1}{R} = \frac{1}{R1} + \frac{1}{R2}$
4. $firstroot = \sqrt{\frac{-b + (b^2 - 4ac)}{2a}}$
5. $\frac{dy}{dx} = 2ax + b$

Q1 (b) (marks 10). 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 = 5 , Y = 5 , A = 2, B = 1, R = 5;
int T1, T2;
bool On_Circle;
enum day {sun,mon,tue,wed,thu,fri,sat};
day today;
string name = "DLAMINI"; string result;

On_Circle = ((X-A)*(X-A)+(Y-B)*(Y-B)) == R*R;
result = name + "+DLAMINI" + "SIBUSISO";
today = wed;
T1 = (X+A)/2 + (Y+B)/2;
T2 = sqrt(X*X + Y*Y - B) + B;

cout << " On_Line = " << On_Circle <<endl
      << " result = " << result << endl
      << " T1      = " << T1 << endl
      << " T2      = " << T2 << endl
      << " shirt   = " << today << endl;
```

Q2 (a) (marks 6 + 4 + 10). A complete program to compute the value of Standard deviation SD as follows –

$$SD = \sqrt{\frac{\sum_{i=0}^{n-1} (\bar{X} - X_i)^2}{n}}$$

is to be developed. Your program should get the values of n and an array of floating numbers X interactively from KBD. The output display should include the values of n , \bar{X} and SD in a good layout. The average of X_i values is computed as \bar{X} .

You should be declaring a function, *mean* to compute the average of given n real numbers in an array X of real numbers. Assume that n is a nonzero positive integer number.

Write Input, Process, Output, Pseudo codes and complete programs in C++ for *mean* and your calling program.

Q2(b) (marks 5+5). Write the exact output produced by your programs of Q2(a) when they are executed for $n = 5$ and X_i array as - **8.0, 12.0, 11.0, 9.0 and 10.0** .

SECTION-B

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

Q4 (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 Commission, Sales;
char Gender;
```

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 right once, $N1 \rightarrow N2 \rightarrow N3 \rightarrow N4 \rightarrow N1$. i.e. the value of $N1$ goes to $N2$, the value of $N2$ goes to $N3$, the value of $N3$ goes to $N4$ and the value of $N4$ goes to $N1$.

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

There is no Commission if Sales is 10000 or less.
Commission is 10 % of Sales, if Sales is 50000 or less,
Commission is 20 % of Sales, if $50000 < \text{Sales} < 100000$ and
Commission is 30 % of Sales, if Sales is 100000 or above.

(iii). Using a switch statement, display 'MALE', if Gender is 'M' or 'm'.
Display 'FEMALE' if Gender is 'F' or 'f'.
Display 'INCORRECT GENDER' otherwise.

(iv). Display the count and all the values in array P which are even. Assume P has maximum 1000 values.

(v). Display the largest value in array P. Assume P has maximum 1000 values.

(vi). Display 'DESCENDING' only if $(N1 > N2 > N3 > N4)$,
'ASCENDING' only if $(N1 < N2 < N3 < N4)$ and
'NOT ORDERED' otherwise.

Q5 (marks 6 + 4 + 5). Information about the three lines is known as their slopes (m) and intercepts (c). It is required to find out the intersecting points of these lines, if they exist. The display should include the lines, coordinates of the points of intersection or a text message – "LINES DO NOT INTERSECT" according to your own layout.

Assume each Line is displayed as - $Y = m X + c$

Write the Input, Process and output, pseudo codes and a program in C++ to solve the above problem. Include suitable comments and proper indentations in your program.

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

```
// Program CS243_Exam_Dec_2013;

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

2345
1234
3456
4056

OR

5671
6709
1001
2222

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

(End of Examination Paper)