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**UNIVERSITY OF SWAZILAND  
RE-SIT / SUPPLEMENTARY EXAMINATION, JULY, 2016**

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

Course number : CS243 / CSC112

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 notation 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 statement corresponding to each of the following mathematical relations to find S, p, Root<sub>1</sub>, R and the derivative,  $dy/d\alpha$ . Use suitable identifiers.

1. 
$$S = \frac{(a+b)(b-c)}{3a^2b^2}$$

2. 
$$p = \sqrt{\frac{(2\alpha - 3\beta)}{\sin^2 \alpha - \cos^2 \beta}}$$

3. 
$$\text{Root}_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

4. 
$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

5. 
$$\frac{dy}{d\alpha} = \frac{\alpha \sin(\alpha) + 2\alpha\beta \cos(\beta)}{3\alpha\beta}$$

**Q1 (b). (10 marks)** Find the values of left hand side identifiers of the following assignment statements. Assume that the following declarations are already given. Show your work and write the exact display produced.

```
const int X = 3 , Y = -5 , R = 1;
int T1, T2;
bool out, Holi_day;

string name = "supl / resit cs243-"; string result;

out = (3 * X + 2 * Y + R + 1) == 0 ;
Holi_day = !( X == Y );
result = name + "+2016" ;
T1 = (2 * X) % (-Y * 3) + 10;
T2 = sqrt(X*X + Y*Y - 9) + R;

cout << " Out      = " << out << endl
     << " result   = " << result << endl
     << " T1       = " << T1 << endl
     << " T2       = " << T2 << endl
     << " Holiday  = " << Holi_day << endl;
```

**Q2(a) (marks 6 + 4).** Write a complete independent program to declare an array of records named – ADMISSIONS\_DATA, implemented as an array of records. The program should read the data interactively in the array, ADMISSIONS\_DATA and write the array onto a text file. The student record has the following information in appropriate fields –

- six digit student id number,
- student's surname,
- initials,
- year of study
- faculty,

Your program should write the array in a text data file (“F:\DATAFILE.TXT”) sequentially, one record in a line and each field separated by at least one space.

Write three records exactly that your program will be writing in the sequential text file.

**Q2(b) (marks 4 + 6 + 10) .** Write a separate main program that

(i). reads complete data in ADMISSSIONS\_DATA array from the file (“F:\DATAFILE.TXT”), created in Q2(a) above.

(ii). Interactively reads an Id of a student and calls the SEARCH function.

(iii). SEARCH function searches the ADMISSIONS\_DATA array and displays on the screen all the information of this Id student in a good layout of your choice. If the search fails, i.e. this Id student is not in the array, an appropriate search fail message should be displayed.

Include a complete SEARCH function, that displays all the record information of a certain student whose Id number is provided as an argument. It should display an appropriate error message if the argument is not in the ADMISSIONS\_DATA array.

## SECTION-B

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

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

```
int Age, N1, N2, N3, N4, BIG, I, J, Temp;
char Answer, grade;
double P [100], Final_mark;
```

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

(i). Display the largest of N1, N2, N3 and N4 by the following actions in sequence –

1. Put N1 in BIG.
2. Put the larger of BIG and N2 in BIG.
3. Put the larger of BIG and N3 in BIG.
4. Put the larger of BIG and N4 in BIG.
5. Display BIG.

(ii). Using a switch statement, display “SHOUT”, if the Answer is ‘S’ or ‘s’. Display “QUITE” if Answer is ‘Q’ or ‘q’. Display “INCORRECT ENTRY”, otherwise.

(iii). Display all the values in array P which are in the range [1, 100]. Assume P has 100 values.

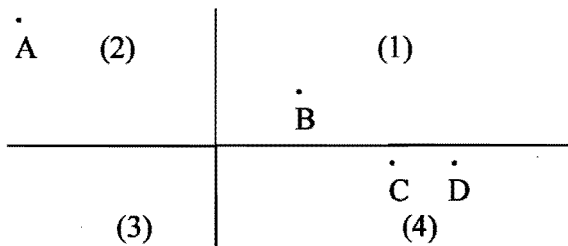
(iv). Display the smallest value in array P. Assume P has 100 values.

(v). Display “CORRECTLY ORDERED IN ASCENDING ORDER” if all the values in array P are in ascending order (i.e.  $P_i \leq P_{i+1}$  for all possible i). Assume P has 100 values.

(vi). Compute a two character grade from Final\_mark according to UNISWA rules.

**Q4 (marks 6 + 4 + 5).** Information about the xy-coordinates of several points is known. It is required to find out and display the quadrant number in which each point lies. Also the display should include the count of points lying in each quadrant. The sentinel point is the origin.

All the information is to be given interactively from the keyboard, The xy-coordinates of points are to be displayed along with the quadrant number on the screen according to your own layout. For example, points A, B, C and D are shown in the following figure :



The point A is in quadrant number 2, the points C and D are in quadrant number 4 and B is in quadrant number 1. The count of points in quadrant numbers 1 to 4 are 1, 1, 0 and 2 respectively.

Write IPO, pseudo code for the above problem. Assume that x-y coordinates of a point are two integers and that no point lies on any axis.

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

```
// Program CS243_SUPL_Exam_JUL_2016;
#include <iostream>
#include <iomanip>
using namespace std;

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

    for (i = 1; i < Size; i++)
    {
        cout << " Enter value number " << i << endl;
        cin >> ST;
        TEMPST = ST; count = 0; sum = 0;
        cout << "DATA    DIGIT COUNT    SUM" << endl;
        cout << ST << endl;
        while ((TEMPST > 0))
        {
            count = count + 1;
            digit = TEMPST % 10;
            sum = sum + digit;
            cout << setw(6) << TEMPST << setw(6) << digit
                << setw(6) << count << setw(6) << sum
                << endl;
            TEMPST = TEMPST / 10 ;
        };
    };
    return (0);
}
```

Give the exact display for either of the following data entered at run time :

7348  
2314  
4386  
4110

**OR**

6551  
6709  
1010  
4444

**(End of Examination Paper)**