

**UNIVERSITY OF SWAZILAND  
SUPPLEMENTARY EXAMINATION, JULY 2009**

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 before you start answering any question.
  - (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).** Write equivalent single assignment statement corresponding to each of the following mathematical relations. Use suitable identifiers. Assume Z, p, X and F as real.

$$i.Z = \frac{12abc}{(a-b)(c-s)}$$

$$ii.p = \sqrt{\frac{(5n-\beta)}{abc}}$$

$$iii.X = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$iv.F = S(1 + R/365)^N + \varepsilon$$

**(8 marks)**

**Q1(b).** Find the values of left hand side identifiers in the following statements. Assume that the following declarations are already given.

```
Const X = 3 ; Y = 2 ; R = 13;
```

```
Type Work_Days = (sun, mon, tue, wed, thu, fri, sat);
```

```
Var Holi_day: boolean; out:integer;  
    Comp_Ch : char; End_day : set of Work_Days;
```

```
i. Out := 3 * X + 2 * Y - R;
```

```
ii. Holi_day := pred (tue) <> succ (sun);
```

```
iii. End_day := [tue, wed, thu] * ([tue, wed] + [wed] );
```

```
iv. Comp_Ch := Chr ( (X + ord('A')) );
```

**(8 marks)**

**Q2.** Write a complete program which declares and tests a function to compute the value of factorial of a given integer,  $n$  ( $n! = 1.2.3 \dots n$ ). If  $n$  is zero or negative, the factorial value should be one. The function name should be *factorial* of real type.

The main program should interactively read three non zero positive integers,  $n$ ,  $r$  and  $p$ . It then computes and displays  $ncr$  and  $rcp$  using the function subprogram *factorial*. The  $ncr$  and  $rcp$  are defined as follows –

$$ncr = \frac{n!}{r!(n-r)!}, \quad rcp = \frac{r!}{p!(r-p)!}$$

Write the user screen with data set of your choice, when your program is executed.

**(6 + 6 + 6 + 6 marks)**

### SECTION-B

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

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

```
Var
    Name: string[15];
    Age, N1, N2, N3, N4 : integer;
    Height, Final_Mark: real;
    Gender, Grade : Char;
    P : array [1..1000] of real;
```

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

(i). Exchange the values of N1 and N2 only if  $N3 > N4$  and  $N1 \neq N2$  .

(ii). Display your age in years as a three digit integer, your height in cms as a real number with one digit after decimal, your name as 15 characters and your Gender as a single character (M or F) as follows -

AGE = --- HEIGHT = ----- NAME = ----- GENDER = -

(iii). Compute letter grade from Final Mark according to UNISWA rules.

(iv). Using a case statement only, display 'MALE', if Answer is 'M' or 'm'. Display 'FEMALE' if Answer is 'F' or 'f'. Display 'INCORRECT ENTRY' otherwise.

(v). Display 'CORRECTLY SORTED 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 500 values.

(vi). Display the count of negative values in the array P. Assume P has 500 values.

**(25 marks)**

**Q4.** Information about the xy-coordinates of centers of three circles and their radii are known. It is required to find the pair of circles which touch each other.

All the information is to be given interactively from KBD. The Output should be displayed according your own lay out. But all the three circles should be displayed as three equations of circles.

Write the analysis (Input, Process and output), pseudo code and a program in PASCAL to solve the above problem. Include suitable comments and proper indentations in your program.

**(20 marks)**

**Q5.** Read the following Pascal program very carefully and write the **exact** display produced on the screen when the program is executed.

```
Program CS243_Exam_July_2007;
Const Size = 3;
Type id = 0 .. 6000;
var ST, TEMPST : id;
    i,j,digit, count, proddigits : integer;

Begin

  for i := 1 to Size do
    begin
      write (' Enter value number ', i:2, ' of id type- ');
      readln(ST);
      TEMPST := ST;
      Count := 0;
      prdigits := 1;
      writeln('DATA DIGIT COUNT PRODDIGITS');
      Writeln (TEMPST:6);
      While TEMPST <> 0 do
        Begin
          Count := count + 1;
          digit :=TEMPST mod 10;
          prdigits := prdigits * digit;
          TEMPST := TEMPST DIV 10;
          Writeln (TEMPST:6, digit:6, count:6, sumdigits:6, prdigits:6);
        End;
      end;
    end.
end.
```

Assume that the data entered at run time is :

2663  
3246  
5428

**OR**

2439  
2556  
1618

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

**(15 marks)**

**(End of Examination Paper)**