

**UNIVERSITY OF SWAZILAND
FINAL EXAMINATION (SEM-I), DEC 2008**

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 to find Z, P, R and X. Use suitable identifiers.

i.
$$Z = \sqrt{\frac{\sin(2n\pi + \beta)}{2\pi n + \beta}}$$

ii.
$$P = (a+b)^m + (c-d)^n$$

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

iv.
$$X = \frac{\sin(a-b) + \cos(a-b)}{a-b}$$

(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 ; A = 2; B = 3; C = 1;
```

```
Type Work_Days = (su, mo, tu, we, th, fr, sa);
```

```
Var Tr: integer; On_Line: boolean;  
    Comp_Ch : char;  
    Holi_day : set of Work_Days;
```

i. `On_Line := A * X > B * Y + C ;`

ii. `Holi_day := [su, sa] * ([pred (mo)] + sa);`

iii. `Tr := (X + B) div (C + B mod A);`

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

(8 marks)

Q2. Write Input, Process, Output, Pseudo code and a complete well documented and indented program to create and display a linear list, class, implemented as an array of student records. The student record has the following fields –

- a six digit student id number,
- count of courses the student is registered and
- course codes of all the courses for which the student is registered.

Your program should display the count of students and average number of courses registered by students in the class and the above data in a good tabular lay out on a disk file. Assume that the above data is read from a text file- 'F:\STUDDTA.TXT' with sentinel data having the student id as zero. Write three correct records of 'F:\STUDDTA.TXT'.

(6 + 9 + 9 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

```
N1, N2, N3, N4, I, J, K, Temp : integer;  
Salary, Tax: real;  
Answer : Char;  
Pay : array [1..1000] of real;
```

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

(i). Display 'IN ORDER' when $N1 \leq N2 \leq N3 \leq N4$ or $N1 \Rightarrow N2 \Rightarrow N3 \Rightarrow N4$.

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

There is no Tax if Salary is 36000 or less.
Tax is 10 % of Salary, if Salary is 65000 or less,
Tax is 20 % of Salary, if $65000 < \text{Salary} < 120000$ and
Tax is 30 % of Salary, if Salary is 120000 or above.

(iii). Using a case 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 in the array Pay which lie in [0, 5000]. Assume Pay has 500 values.

(v). Display the largest value among N1, N2, N3 and N4.

(vi). Find K which is I, if J is zero. K is 100 – I if J is one.

(25 marks)

Q4. 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 coordinates of the points of intersection or a text message that lines do not intersect according to your own layout.

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 screen when the program is executed.

```
Program CS243_Exam_Dec_2007;
Const Size = 3;
Type id = 0 .. 6000;
var TEMPST : id;
    i,j,digit, count, Sum, Prod : integer;

Begin

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

end.
```

Assume that the data entered at run time is :

2163
3528
5426

OR

2413
5976
2359

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

(15 marks)

(End of Examination Paper)