

**UNIVERSITY OF SWAZILAND
SUPPLEMENTARY EXAMINATION, JULY 2006**

Title of Paper : PASCAL

Course number : CS245 (I)

Time allowed : Three (3) hours.

Instructions : (1) Answer all questions in Section-A. Choose options as given in questions.

(2) Read all the questions in Section-A and Section-B before you start answering any question.

(3) Show your work on the answer script.

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.

$$1. C = \sqrt{\frac{1}{(x+y)^n}}$$

$$2. P = p_0 e^{-kt} + O(h)$$

$$3. F = a \sin(m\theta) + b \cos(n\theta)$$

$$4. \frac{dy}{dx} = 3\sin(x) + 2xy$$

(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 = 6;

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

Var Today : Work_Days; On_Line: boolean;
Comp_Ch : char; End_day, Holi_day : set of Work_Days;

1. On_Line := A * X + B * Y + C = 0;
2. Holi_day := [pred (mon)] + [succ (fri)];
3. End_day := [tue, wed, thu, fri] * ([mon, tue, wed] + [tue]);
4. Comp_Ch := Chr ((C + ord('A')));

(8 marks)

Q2 (a). Declare a function subprogram to compute the smallest value of given real numbers in an array. The function name should be **smallest** and of real type. The array name and count of values in the array should be two value type formal arguments of the function. Assume the following declaration is already given.

Type numbers = array[1 .. 1000] of real;

(10 marks)

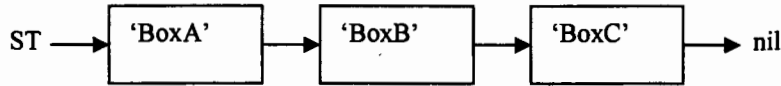
Q2 (b). Declare a procedure subprogram which takes two arrays, say X and Y of numbers type (as given in Q2(a)) both having equal count of values, say N. The procedure takes X, Y and N as formal arguments and returns the computed value of PAR, defined as –

$$PAR = \text{smallest}(XY, N) - \text{smallest}(X, N) * \text{smallest}(Y, N)$$

Where $XY [i]$ is $X[i]*Y[i]$ for all i. Use smallest function of Q2(a).

(12 marks)

Q3. Write a complete program that creates the following chain of box type records.



The box is a record which has two fields – a six character box name and the other is a pointer of box pointer type. The address of the first box in the chain is at ST and the last box points to nil. Other boxes have names and links as shown above.

Also now write a procedure DELETE_FRONT, which takes ST as an argument and returns ST so that the first box is removed, only if ST is not nil.

(8+4 marks)

SECTION-B

Q4. Assume that reading is from KBD and display is on VDU and the following declarations are already given -

```

Var
  Name: string[15];
  Age, N1, N2, N3, N4 : integer;
  Total_amount, Salary, Tax: real;
  Gender, Answer, Grade : Char;
  A : array [1..25, 1..25] of real;
  
```

Write only executable statements in Pascal (not a complete program) to perform any four of the following tasks independently. Include all other declarations in your answer, if necessary.

(i). Display last four digits of your ID, name, year of study and date of birth on the screen in the following lay out exactly –

```

ID = ----,   YEAR OF STUDY = -,   DATE OF BIRTH = --/--/----
NAME = -----
  
```

(ii). Display 'IN ORDER' if N1, N2 and N3 are either in ascending or descending order.

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

Tax is 36 % of Total_Amount, if Total_Amount is 36000 or above,
Tax is 20 % of Total_Amount, if Total_Amount is 20000 or above but less than 36000,
Tax is 10 % of Total_Amount, if Total_Amount is less than 20000 but greater than 10000
There is no Tax if Total_Amount is 10000 or less.

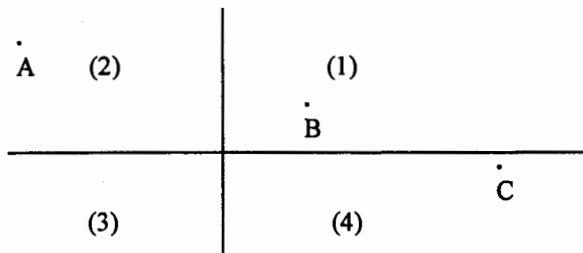
(iv). Display the row number, column number and the value of the largest element in matrix A. Assume that the matrix A is of order 10 by 15.

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

(marks 20)

Q5. Information about the xy-coordinates of five points (A, B, C, D and E) is known. It is required to find out the quadrant number in which each point lies.

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. The following figure explains –



The point A is in quadrant number 2, the point C is in quadrant number 4 and B is in quadrant number one.

The display layout should be exactly as follows -

The POINT A (----.---, ---,--) LIES IN QUADRANT NUMBER -

The POINT B (----.---, ---,--) LIES IN QUADRANT NUMBER -

The POINT C (----.---, ---,--) LIES IN QUADRANT NUMBER -

The POINT D (----.---, ---,--) LIES IN QUADRANT NUMBER -

The POINT E (----.---, ---,--) LIES IN QUADRANT NUMBER -

Write the complete analysis, pseudo code and a program in PASCAL to solve the above problem. Include suitable comments and proper indentation in your program. If a point lies on a axes, the quadrant number should be zero.

(marks 15)

Q6. Read the following Pascal program very carefully and write exact display produced on VDU when the program is executed.

```
Program SExam_2005;
Const Size = 6;
Type id = 0 .. 6000;
    Class_List = array[1 .. 100] of id;

var CS245 : Class_List; Big_value,Temp : id;
    i,j,k, Big_Position : integer;

Procedure Show_List (N : integer; A : Class_List);

    var i : integer;

begin
    for i := 1 to N do Write(A[i]:6);
    writeln;
end;

Begin
    writeln (' Enter ', Size:2, ' values of id type');
    for i := 1 to Size do readln(CS245[i]);

    Show_List(Size, CS245);
    For i := 1 to Size - 1 do
        begin
            Big_Position := i; Big_Value := CS245[i];
            for j := i+1 to Size do
                if (CS245[j] > Big_Value) then
                    begin
                        Big_Value := CS245[j];
                        Big_Position := j;
                    end;
            End;

            Temp:= CS245[i];
            CS245[i] := CS245[Big_Position];
            CS245[Big_Position] := Temp;
            Show_List(Size, CS245);
        end;
    end.
```

Assume that the data entered at run time is :

(a). 2660 3246 1428 2711 3211 2599 <enter>

OR

(b). 2409 2550 1618 2786 3218 2197 <enter>

Give the exact display for either of the above

(marks 15)

(End of the Examination Paper)