

UNIVERSITY OF SWAZILAND
FINAL EXAMINATION 2004 / 2005

- 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 in Section-B.
- (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 to compute Z, p, X and F. Use suitable identifiers.

$$1. Z = \frac{12abc}{(a-b)(c-s)}$$

$$2. p = \sqrt{\frac{(5n-\beta)}{abc}}$$

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

$$4. F = S(1 + R/365)^N + \varepsilon$$

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

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

(8 marks)

Q2 (a). Declare a function (subprogram) to compute the value of factorial n (n! = 1.2.3 ... n). Assume that n is a nonzero positive integer number. The function name should be *factorial* of real type.

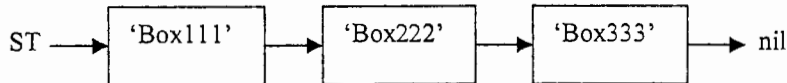
(10 marks)

Q2 (b). Declare a procedure (subprogram) which takes three non zero positive integer numbers, n , r and p . The procedure returns two real values ncr and rcp . The procedure name should be *Bin_Cof* and it should use the function subprogram factorial of Q2(a) to find the values of ncr and rcp as follows -

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

(12 marks)

Q3. Write a complete well documented and well indented program to create a linear chain of box records which looks as follows -



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 should be at ST and the last box should point to nil. Other boxes have names and links as shown above.

(12 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 : integer;
  Height, Mark: real;
  Gender, Answer, Grade : Char;
  P : array [1..1000] 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 you need.

(i). 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 = -

(ii). Circulate right the values in N1, N2 and N3 so that the value in N1 goes to N2, the value in N2 goes to N3 and the value in N3 goes to N1.

(iii). Compute letter grade from Mark according to the university rules –

Grade is A if Mark > 79, it is B if Mark > 69, it is C if Mark > 59, it is D if Mark > 49,
it is E if Mark > 39 and it is F otherwise.

(iv). Using a case statement, 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.

(marks 20)

Q5. Information about a circle - coordinates of the centre and its radius are given. The x and y coordinates of three points, A,B and C are also given.. It is required to find out the status of each point where the status of a point can be 'INSIDE' or 'OUTSIDE' the circle.

The display layout should be exactly as follows -

The circle is - $(x - ____)^2 + (y - ____)^2 = ____ ^2$

Point A = ($____ , ____$), Status = _____

Point B = ($____ , ____$), Status = _____

Point C = ($____ , ____$), Status = _____

Write the complete analysis, Input, process, output, pseudocode and a program in PASCAL to solve the above problem. Include suitable comments and proper indentation in your program.

(marks 15)

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

```

Program Exam2005;
Const Size = 5;
Type id = 0 .. 6000;
    Class_List = array [1 .. 100] of id;

var CS245    : Class_List; Temp : id;
    i       : integer;
    In_Order : boolean;

Procedure Show_List (M : integer; A : Class_List; Status : boolean);

    var i : integer;

begin
    for i := 1 to M do Write(A[i]:6);
    writeln(' ',Status);
    writeln;
end;

Begin
writeln (' Enter ', Size:2, ' values of id type');
for i := 1 to Size do readln(CS245[i]);
In_Order := false;
Show_List(Size, CS245, In_Order);
While not In_Order do
begin
    In_Order := true;
    for i := 1 to Size-1 do
        if (CS245[i] < CS245[i+1]) then
            begin
                Temp := CS245[i];
                CS245[i] := CS245[i+1];
                CS245[i+1] := Temp;
                In_Order := false;
            end;
        Show_List(Size, CS245, In_Order);
    end;
end.

```

Assume that the data entered at run time is :

(a). 52 36 18 21 31 29 <enter>

OR

(b). 1402 2552 3611 4782 1212 2198 <enter>

Give the exact display for either of the above showing all your work. (marks 15)

(End of Examination paper)