The Open University of Sri Lanka

B.Sc. Degree Programme: Level 04

Closed Book Test – 2005
CSU 2279-Data Structures and Algorithms

DURATION: ONE AND HALF HOURS

Date: 16.03.2006 ***Time: 4.00 pm to 5.30 pm***

Answer **ALL** questions.

Q1.

I. What are the factors you should consider when selecting a sorting algorithm for implementation?.

II. Compare and contrast ***Bubble Sort*** algorithm with ***Selection Sort*** algorithm.

III. Write down the ***Insertion Sort*** algorithm.

IV. Briefly explain how your algorithm (in part –III) works on the following set of data. (Suppose the following twelve integers are stored in contiguous cells of an array). **Clearly show all the necessary steps.**

110, 50, 155, 72, 30, 142, 170, 33, 87, 146, 115, 16

Q2.

I. Briefly explain the advantages and disadvantages of the Big-oh notation.

II. What are the four factors on which the running time of a program depends on?.

III. Calculate the running time of the following functions/procedure using the Big-oh notation.

(a)
```
Procedure odd (n: integer);
 var
      i, j, x, y : integer;
begin
      for i: =1 to n do
          if odd (i) then
  begin
       for j: =1 to n do
             x: =x+1;
            for j:=1 to i do
            y: =y+1;
  end;
end;
```

(b)
```
Function recursive (n: integer): integer;
begin
      if n <= 1 then
          return (1)
      else
        return( recursive (n-1) + recursive (n-1));
 end;
```

(c).
```
Function fact (n: integer): integer;
   begin
  If n=1 then
     fact : =1
else
      fact :=n*fact (n-1);
end;
```

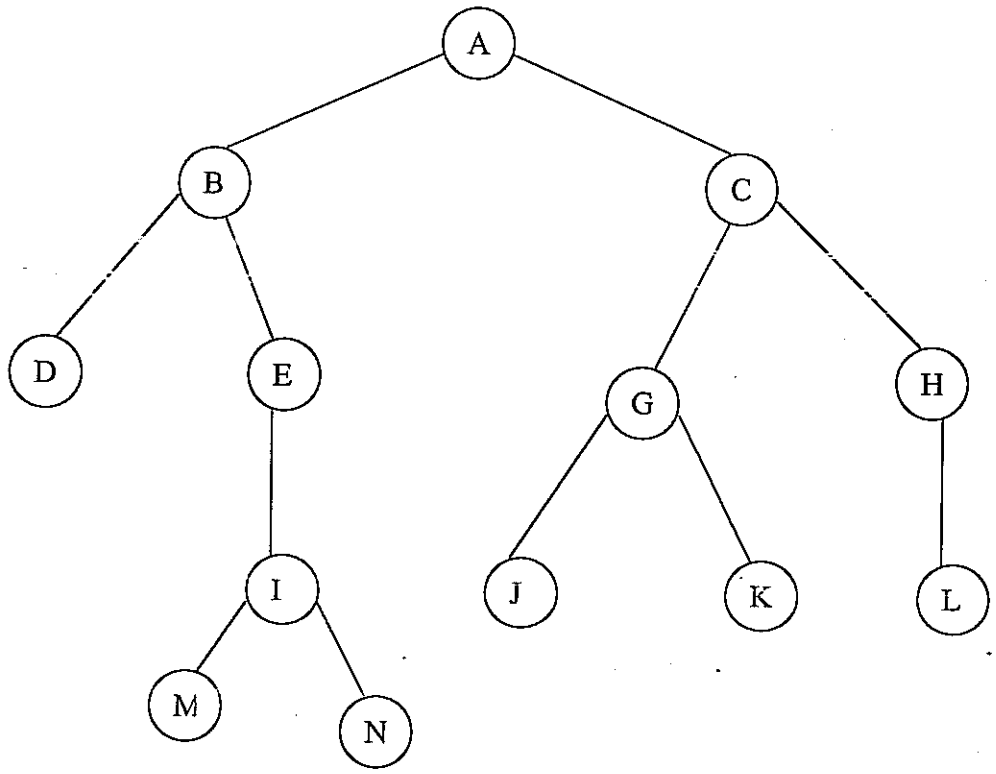
Q3.

I. The order of nodes of a Binary Tree in Preorder and Inorder Traversal are as follows:

Inorder Traversal: B C E D F A G H
Preorder Traversal: A B C D E F G H

Draw the corresponding Binary Tree.

II. Use the tree structure (B1) depicted below to answer the questions (a) to (e).



B1 tree

(a). Give the preorder, inorder and postorder traversal of the tree B1.

(b). Is B1 a binary tree?. Justify your answer.

(c). Which nodes are ancestors of E and descendants of E?

(d). What is the depth of the above tree?

(e). What will be the result if the root of the tree (node A) is removed? Explain briefly. **Clearly draw the resultant diagram of the above tree structure.**

III. Assuming that there is no simple data type in Pascal to represent character strings, wri suitable Pascal procedures/functions to implement the following string operations.

(i). POS (S1, S2) – Returns the starting position of S1 in S2. Function prototype given bel ow.

FUNCTION POS (S1, S2: STRING): Stringsize;

(ii). CONCAT (S1, S2, S3) – Concatenates S1 and S2 and the result will be in S3. Procedure prototype is given bellow.

PROCEDURE CONCAT (VAR S1, S2, S3: String);