2012
DATA STRUCTURE WITH C

Time Allotted : 3 Hours   *Full Marks : 70*

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following questions:

$10 \times 1 = 10$

i) $f(n) = O(g(n))$ [Big – O] implies

a) $|f(n)| >= c^* |g(n)|$ where $n >= n_0$, c and n_0 are constants

b) $|f(n)| = c^* |g(n)|$ where $n >= n_0$, c and n_0 are constants

c) $|f(n)| <= c^* |g(n)|$ where $n >= n_0$, c and n_0 are constants

d)   None of these.

ii) The binary tree data structure can be implemented using

   a) Doubly linked list   b) Array

   c) Stack   d) Both (a) and (b).

iii) What will be the output of **sizeof (s)** and **printf ("%s", s)** for the following initalization ?

   char s [ ]="ab\0cde";

   a) 2,ab   b) 6, ab\0cde

   c) 7, ab\0cde   d) 7, ab.

iv) The deque where insertion is possible at one end but deletion is possible from both ends is known as

   a) Input restricted deque

   b) Output restricted deque

   c) Input less deque

   d) None of these.

2

v) What will be the output of the following code ?

```
int main ()
{
        void fn();
        fn();
        return 0;
}
void fn()
{
        fn();
}
```

a)   Compilation error

b)   Stack overflow problem

c)   Infinite time execution

d)   None of these.

vi)   The postfix form of A*B + C/D is

a)   *AB/CD +   b)   AB*CD/+

c)   A*BC+/D   d)   ABCD + /*

vii)   The preorder and post-order Traversal of a binary tree generate the same output. The tree can have maximum

a)   Three nodes   b)   Two nodes

c)   One node   d)   Any number of nodes.

[Turn over

viii) What are the notations used in Evaluation of Arithmetic Expressions using prefix and postfix forms ?

    a)   **Polish and Reverse Polish notations**

    b)   Polish notation

    c)   Reverse polish notation

    d)   None of these.

ix) How many null branches are there in a binary tree with 20 nodes ?

    a)   23   b)   22

    c)   20   d)   21 .

x) In an AVL tree, at what condition the balancing is to be done ?

    a)   If the 'pivotal value' (or the 'Height factor') is greater than 1

    b)   If the 'pivotal value' (or the 'Height factor') is less than -1

    c)   If the 'pivotal value' (or the 'Height factor') is greater than 1 or less than -1

    d)   None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. What is sparse matrix ? How a sparse matrix can be implemented to save the memory spaces ? (Explain with diagram only) $2 + 3$

3. Write a function in C to evaluate a postfix expression. 5

4. a) What are the difference between BFS and DFS ?

   b) What is hashing ? Why is it used ? $3 + 2$

5. a) Given code :

   ```
   for(i=0;i<n;i++)

   for(j=0;j<n; j++)

       s=s+1;
   ```

   Calculate (explain) the running time of above code using Big-oh notation.

   b) When we have only an asymptotic lower bound which notation do we use ? $4 + 1$

6. Draw the B-tree of order 3 created by inserting the following data arriving in sequence :

   92 24 6 7 11 8 22 4 5 16 19 20 78 5

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. What is priority queue ? How will you implement a priority queue using heap ? Explain with suitable example. (Use diagram only)

$5 + 10$

8. Construct an AVL tree using the followind data :

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

[Show each step of insertion as well as direction of rotation where necessary. The month name in the AVL tree must be placed as their position in the dictionary, e.g. Feb should be the left child of Jan.]

15

9. a) How a polynomial such as $6x^4 + 2x^3 + x + 3$ can be represented by a linked list ? Write an algorithm that reads such a polynomial, take derivate of the polynomial and print the result.
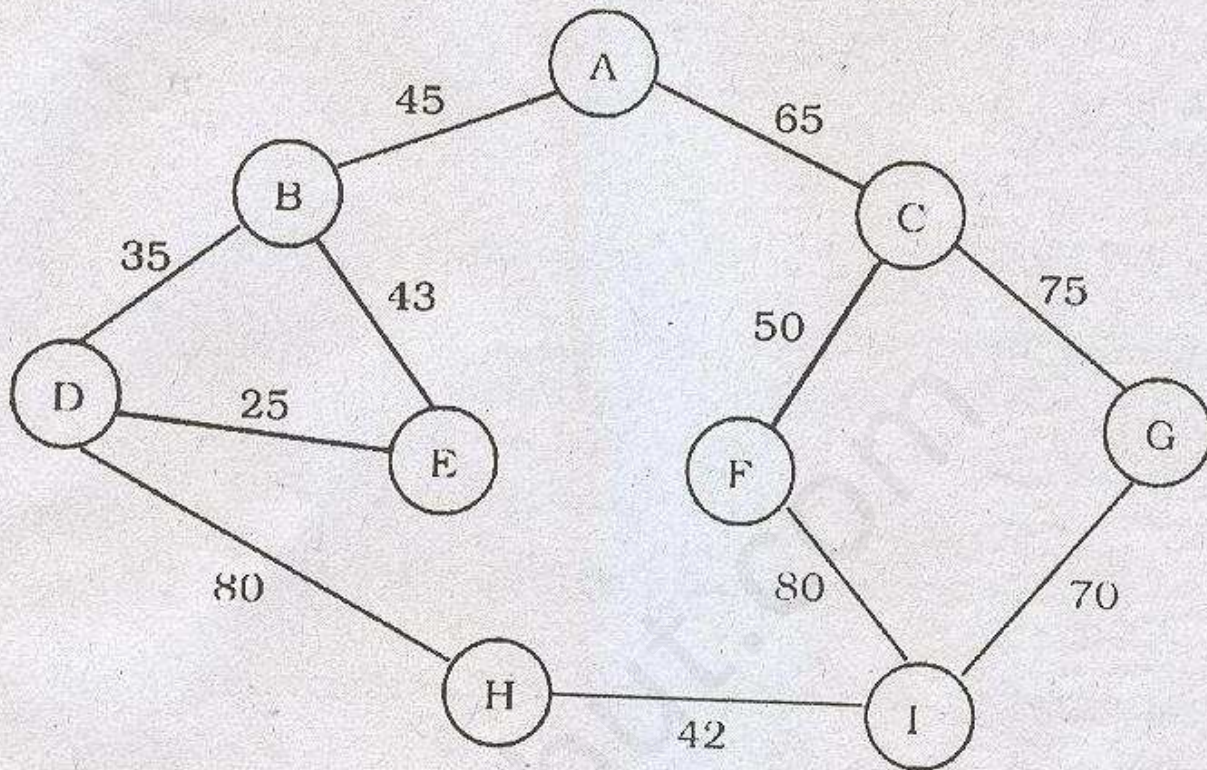
   b) Construct the binary tree from the following information :

   Inorder : D B F E A G C L J H K

   Postorder : D F E B G L J K H C A

   c) Explain the advantages of Binary Search over Sequential Search.

$7 + 6 + 2$

10. a) Obtain the minimal spanning tree formed using Kruskal's algorithm for the following graph.

b) Write the algorithm of Heap sort

c) Explain the time complexity of Heap sort.   7 + 6 + 2

11. Write sort notes on any *three* of the following :   3 × 5

a) Threaded Binary Tree

b) Brute Force algorithm

c) Priority queue

d) Linear probing

e) Sparse matrix.

_____