Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/MCA / SEM-2 / MCA-203 / 2011

2011

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 : $10 \times 1 = 10$

i) Consider *A*, *B* and *C* will be pushed into stack in the same order as given. Which of the following options is not possible outcome after pop operations ?

a) *A*, *B*, *C* b) *B*, *A*, *C*

c) *C*, *B*, *A* d) *C*, *A*, *B*.

ii) What is the maximum possible number of nodes with level n of a binary tree ? Consider root at level 1.

a) $2^{n+1}-1$ b) $2^{n}-1$

c) $2^{n}+1$ d) 2^{n}.

iii) The complexity of binary search algorithm is

a) $O(n)$ b) $O(n\log_2 n)$

c) $O(n^2)$ d) $O(\log_2 n)$.

iv) Return type of function main ( ) returns value to the

a) Operating system b) Compiler

c) Linker d) Loader.

v) What kind of data structure do you prefer for implementation of polynomial ?

a) Array b) Linear Linked List

c) Tree d) Graph.

vi) Compaction reduces ..... fragmentation.

a) external b) internal

c) both (a) and (b) d) neither (a) nor (b).

vii) Adelson Velski and Landies tree is a ..... tree.

a) Unbalanced binary

b) balanced binary

c) binary search

d) balanced binary search.

viii) Recharging your mobile balance is a ..... policy.

a) LIFO b) priority based

c) FIFO d) none of these.

ix) What is the time complexity of the binary search ?

a) $O(n)$ b) $O(n^2)$

c) $\log(n)$ d) $n\log(n)$.

x) The order of nodes in a linear linked list is maintained by

a) value within the node b) addresses of nodes

c) compiler d) pointer of the node.

GROUP – B

(Short Answer Type Questions)

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

2. Define circular queue. Indicate the advantages of circular queue over linear queue. Define priority queue. 1 + 3 + 1

3. What is hashing ? What is chaining ? What are the characteristics of hash function ? What is re-hashing ?

1 + 1 + 2 + 1

4. What is collision ? Discuss linear probing method to resolve collision. 1 + 4

5. What is tail recursion ? How is it different from ordinary recursion ? What are the differences between iteration and recursion ? 1 + 2 + 2

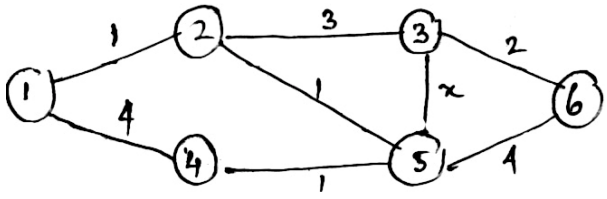
6. Given preorder and postorder traversal, justify if it is possible to find out the corresponding in order traversal. 5

GROUP – C

(Long Answer Type Questions)

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

7. a) Determine the admissible value of x in the following figure so that there is a unique shortest path from node 1 to node 6 :



Is there any other choice of x, which would result in another shortest path between node pair 1 and 6 ? If so, find all such combination of x values indicating the corresponding shortest path.

b) Indicate how a binary tree may be converted into a linear data structure. 10 + 5

8. a) What is *B*-tree ? Insert the following keys into a *B*-tree of order 5 :

   20, 80, 55, 15, 116, 39, 76, 124, 103, 48, 200, 98, 175, 235, 28, 114, 132, 164.

   b) Insert the following numbers into Max heap and Min heap :

   39, 89, 12, 67, 56, 43, 54, 98, 6, 60, 95, 26. 10 + 5

9. Draw a digraph corresponding to each of the following relations on the integers ranging over 1 to 12 :

   i) x is related to y if $x - y$ is eventually divisible by 3.

   ii) x is related to y if $x + 10\ y < xy$

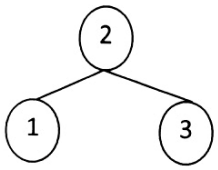
   iii) x is related to y if the remainder on division of x by y is 2. 15

10. Write an algorithm or function to insert an intermediate node in a doubly linked list. Explain the advantage of threaded binary tree. Distinguish between depth and height of a binary tree with the help of an example. 9 + 3 + 3

11. Construct a Binary Search Tree with the following nodes. The order of insertion is same as it appears :

JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC.

Specify the difference between general tree and binary tree considering the following tree :



Construct an AVL tree with the following nodes. The order of the nodes is same as it appears.

BIN, FEM, IND, NEE, LAL, PRI, JIM, AMI, HEM, DIN. 6 + 2 + 7

==========