Invigilator's Signature : $\qquad$

## CS/B.Tech(BME)/SEM-5/CS-502/2009-10 2009

## DATA STRUCTURE AND ALGORITHM

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 :

$$
10 \infty 1=10
$$

i) Complexity of the Binary search algorithm is
a) $O(n)$
b) $O\left(2^{n}\right)$
c) $O\left(\log 2^{n}\right)$
d) $O\left(n^{2}\right)$.
ii) Hashing is a method of
a) sorting
b) searching
c) inserting
d) deleting.
iii) No. of elements present in queue is
a) Rear + Front - 1
b) Rear - Front - 1
c) Rear - Front + 1
d) Rear + Front.
iv) The maximum number of nodes possible in a complete binary tree of height ' $n$ ' is
a) $2 n+1$
b) $2 n-1$
c) $2+6 n$
d) $2^{n}-1$.
v) With every use of a memory allocation function, which function should be used to deallocate the memory which is no longer needed?
a) release ()
b) free( )
c) mallo()
d) callo ().
vi) Which data structure is used for BFS of graph ?
a) Stack
b) Queue
c) Linked list
d) Both (a) \& (b).
vii) For Bubble sort if number of elements is 8 then what is the number of comparisons needed to sort the list?
a) 28
b) 25
c) 26
d) 27 .
viii) The tree traversal technique in which the root is traversed before its children is known as
a) post-order
b) pre-order
c) in-order
d) last-order.
ix) A linear list in which elements can be added or removed at either end but not in the middle is known as
a) queue
b) dequeue
c) stack
d) graph.
x) The in-order traversal of a Binary search tree produces the numbers in $\qquad$ order.
a) ascending
b) descending
c) reverse
d) none of these.

2. What do you mean by Data Structure ? Briefly explain the classification of Data structure.
$2+3$
3. What is time complexity ? Explain the significance of $0, \theta, \Omega$ notations.
4. Write down the differences between Breadth-First Search ( BFS ) and Depth-First-Search ( DFS ) with a suitable example.
5. a) What is connected graph ? Describe the linked representation of graph. $\quad 1+2$
b) What are the advantages of linked list over array? 2
6. What are the complexities ( best \& worst case ) for the following ?
a) Quick sort
b) Binary search
c) Insertion sort.

## GROUP - C

## ( Long Answer Type Guestions )

Answer any three of the following. $3 \infty 15=45$
7. a) Define queue.
b) Explain the limitation of linear queue insertion operation \& explain the solution with insertion algorithm or $c$ code.
c) Define priority queue.
d) Compare and contrast different hash functions.

$$
2+5+2+6
$$

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8. a) Write the code to create and display the node of a linked list.
b) Write an algorithm or $c$ function to insert a node at beginning \& end position of a circular linked list.
c) Represent the following polynomial by linked list ( show the diagram only ) :

$$
10 x^{8}-9 x^{5}+3 x^{3}+2 x^{2}-8 x-5 .
$$

d) What is doubly linked list? Write an algorithm or $c$ function to insert a node after a particular node in a doubly linked list.
9. a) What is binary search tree ?
b) Construct an expression tree for the expression :

$$
E=(\partial x+y-z) /(5 a * 3 b / 6 c) .
$$

c) Write down the algorithms or $c$ functions for PUSH \& POP operations on stack.
d) The pre-order and in-order traversal sequences of nodes in a binary tree are given below :

$$
\begin{aligned}
& \text { Pre-order - M A D H U S M I T A } \\
& \text { In-order - M A D H U S M I T A }
\end{aligned}
$$

Construct the binary tree and state the logic to construct the tree.
$2+2+6+(3+2)$
10. Write short notes on any three of the following :
$3 \infty 5$
a) Threaded Binary Tree
b) Hashing Function
c) B Tree
d) Digraph
e) Inverted file
f) AVL Tree.

