

FACULTY OF INFORMATICS

B.E. 2/4 (IT) I Semester (New) (Main) Examination, Dec. 2011/Jan. 2012

DATA STRUCTURES

Time: 3 Hours]

[Max. Marks: 75

Note: Answer *all* questions of Part A. Answer *five* questions from Part B.

PART – A

(25 Marks)

1. Consider array A [– 10 30] of float values and assuming that float value occupy 2 cells each and array A begins at address 100. What is the address of element A [20] ?
2. Consider recursive and iterative versions of factorial algorithm. Which of the following statements are correct ?
 - a) Recursive version is more complex with respect to time and space than iterative version.
 - b) Recursive and iterative versions are of same time and space complexity.
 - c) Time complexity for recursive and iterative versions is same but space complexity for iterative version is less.
 - d) Space complexity for recursive and iterative versions is same but time complexity for iterative version is less.
3. What is the value of the postfix expression 6 3 2 4 – + * ?
4. What is the maximum path length from start to finish for any maze of dimension $m \times p$?
5. A linked data structure is constructed with nodes with only one link per node, and there is exactly one node with link field NULL. Is this data structure necessarily a linked list or not ? Defend your answer.
6. What are the advantages of doubly linked lists over singly linked lists ?

7. Given a binary tree with 18 nodes, what is the minimum possible depth of the tree.
8. Given the following traversals of a binary tree, draw the tree.

PREORDER : DQBAFNG

INORDER : QBDNFAG

9. For quick sort, what arrangement of the input data will cause the worst-case performance the best-case performance ?
10. What is a splay tree ?

PART – B

(50 Marks)

11. a) Represent the following Sparse matrix using sequential and linked representations (i.e. by using arrays and linked lists).

1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
9	0	0	0	0	5	0	0
0	0	0	2	0	0	0	0

Assume integer occupies 4 bytes and pointer occupies 4 bytes. Estimate the storage space required in both the representations.

- b) Derive a mapping function for a three dimensional matrix for row major order representation.

12. a) Suppose a stack ADT is implemented using an array, write C++ code for the following operations :

i) push

ii) pop

iii) IsEmpty ()

iv) IsFull ()

v) MakeEmpty ()

- b) Use the above operations of stack to write the following function copy a stack S to Stack D :

```
void copy (Stack & S, Stack & D) / * copies stack S to Stack D*/
```

13. Write C++ code to implement following operations on a linked list.

- Reverse the list in place
- Find n^{th} element from last position in single pass
- Find position of element X.

14. a) Draw the complete heap-ordered tree that corresponds to the following array representation of a max-heap, then draw the result of inserting X into the heap, then give the contents of the heap-ordered array corresponding to your result.

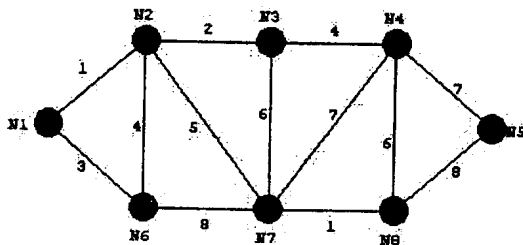
i	0	1	2	3	4	5	6	7	8	9	10	11
a [i]	-	U	T	C	S	M	A	B	R	L	E	D

b) Write a function make tree that converts a sorted array in to a binary search tree. The constructed tree should be nearly balanced.

15. a) Explain insert operation in AVL tree with suitable example.

b) Write a function for insertion sort.

16. Use Prim's algorithm to find the minimal cost spanning tree for the following graph :



17. Write short notes on :

- Threaded binary trees
- Double hashing
- Iterators for chains.