

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

B. Tech.
(SEM III) ODD SEMESTER
THEORY EXAMINATION 2013 - 2014
DATA STRUCTURES USING C

Time: 3 Hrs.

Max. Marks: 100

Note: Attempt all questions.

Q.1 Attempt any four parts of the following: 4 x 5 = 20

- (a) Obtain the indexing formula for lower-right and upper right triangular matrices using row – major and column – major order for a non – square matrix of order $m \times n$, $m \neq n$
- (b) Give data Structure for efficient implementation of a Sparse Matrix. Write a C function for transposition of such matrices.
- (c) Write a C function to locate the position of a substring in s given string, without using the functions defined in *string.h*.
- (d) Write a C function that search the KEY of a information to delete the node of the singly Linked List containing that information and return the resulting list.
- (e) Define Doubly Linked List. Explain implementation of Stack and Queue data structures on the Doubly Linked List.
- (f) Give the linked list representation of polynomials. Also write C function to add two such polynomials.

Q.2 Attempt any two parts of the following: 2 x 10 = 20

- (a) Write a routine prefix to accept an infix string and create the prefix from of that string, assuming that the string from right to left and that the prefix string is created from right to left.
- (b) Define Stack ADT. Write C function to transfer elements from stack S_1 to stack S_2 so that the elements from S_2 are in the same order as on S_1 .
 - i. Using one additional stack
 - ii. Using no additional stack but some additional variables.
- (c) A *deque* is an ordered set of items from which items may be deleted at either and into which items may be inserted at either end. Call the two ends of a deque as Left and Right. How can a deque be represented as a C array? Write following four C routines :

remvleft, remvrigh, insrtleft, insrtright

to remove and insert elements at the left and right ends of deque. Make sure that the routine work properly for the empty deque that they detect overflow and underflow.

Q.3 Attempt any two parts of the following: 2 x 10 = 20

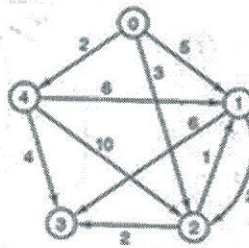
- (a)
 - i. Write C functions to count the number of nodes in a binary tree, the number of leaves, and the height of the tree.
 - ii. Consider a tree with each node having degree either 0 or 3. Computer the number of leaf nodes if internal nodes are N .

- (b) i. Find the preorder of a binary tree with node a, b, c, d, e, f and g, for which the inorder and postorder traversals result in the following sequences.
- | | |
|-----------|---------------------|
| Inorder | a, f, c, d, g, e |
| Postorder | a, f, c, g, e, d, b |
- ii. Write C functions for inserting and deleting a node in a Binary Search tree.
- (c) i. Define AVL tree. Write C functions for LeftRotation and RightRotation of a node of binary search tree.
- ii. Compute the minimum and maximum numbers of leaves in a AVL tree of height h.

Q.4 Attempt any two parts of the following:

2 x 10 = 20

- (a) i. Define graph $G = (V, E)$. What is the relationship between the sum of the degrees of all vertices and the number of edges of the graph?
- ii. Discuss the BreadthFirstSearch algorithm of Graph with example.
- (b) Explain Prim's algorithm to find Minimum Cost Spanning tree for a graph. Using this algorithm find the Minimum Cost Spanning tree for the following graph :



- (c) Define multi-way search trees. Construct B+ - tree of order 5 for following key sequence.

A Z B Y C X D W E V F U G T H S I R K Q L P M O N

Q.5 Attempt any two parts of the following:

2 x 10 = 20

- (a) i. Write a C function for bubble sort of given sequence of number. Consider the following sequence of numbers.
- 92, 37, 52, 12, 11, 25
- ii. Use bubble sort to arrange the sequence in ascending order. Give the sequence at the end of each of the first five passes.
- (b) Define Min-Heap. Draw the min-heap that results from insertion of the following elements in order into an initially empty in-heap: 9, 8, 7, 6, 5, 4, 3, 2, 1. Show the result after the deletion of the root of this heap.
- (c) Write short notes of the following :
- i. Merge Sort.
 - ii. Hash Function.