Hall Ticket Number:

Code No. : 21111

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (C.S.E.) II Year I-Semester (Main & Backlog) Examinations, Nov./Dec.-2016

Data Structures

Time: 3 hours Max. Marks: 70

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. Show that $n(n-1)/2 = O(n^2)$.
2. What is the advantage of doubly linked list over singly linked list?
3. Can we implement a circular queue of size n with an array of size n? Justify your answer.
4. What is the minimum number of stacks required to implement a queue?
5. List all binary search trees possible with keys 10, 12, 8 and 6.
6. Define balance factor of a node in an AVL tree.
7. What is the minimum and maximum number of edges a connected graph can have with 'n' vertices.
8. Define a Minimum Spanning Tree (MST).
9. Which of the following pair is efficiently merged?
   A: (10, 15, 22, 43, 52) and (6, 12, 18, 26, 48)
   B: (6, 10, 12, 15, 18) and (22, 26, 43, 48, 52)
   Justify your answer.
10. Let T_1 and T_2 be two heaps with 38 and 56 elements respectively. What is the difference between heights of T_1 and T_2?

Part-B (5 × 10 = 50 Marks)

11. a) Write a function to delete the k^{th} node from a singly linked list with appropriate test conditions. [6]

    b) Let an array A be declared and defined as: int A[3][4] = {10,20,30,40}, {15,25,35,45},{12,22,32,42}. Represent A using the row-major ordering and the column-major ordering. [4]

12. a) Explain with an example how to implement two stacks in one array A[1 .. n] in such a way that neither stack overflows unless the total number of elements in both stacks together is n. Write functions for push (insert) and pop (remove) operations of stack. [5]

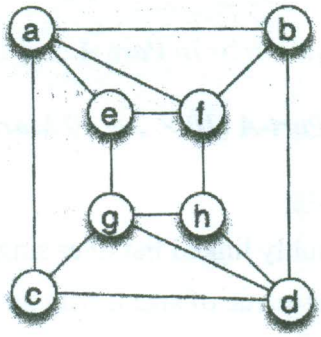
    b) Explain hashing with linear open addressing with a suitable example. [5]

13. a) Define a tree. With pseudo code and suitable example explain *inorder* traversal of a binary tree. [5]

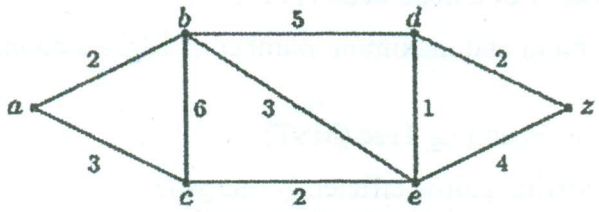
    b) Define a Binary Search Tree (BST). With pseudo code and an example explain insertion operation on a BST. [5]

Contd...2

14. a) Define a graph. What are different ways of representing graphs? Apply BFS algorithm to the following graph and find four different BFS orderings by considering the vertex b as the source vertex. [6]



b) Determine two Minimum Spanning Trees of the following graph by applying Prim's algorithm if exist. [4]



15. a) Show the result of inserting 10, 12, 1, 14, 6, 5, 8, 15, 3, 9, 7, 4, 11, 13 and 2 one at a time, into an initially empty binary heap. Also sort the above elements by applying heap sort algorithm. [5]

b) Write a pseudo code Quick sort algorithm. [5]

16. a) Define sparse matrix. Explain an efficient method used to represent sparse matrix. [4]

b) Convert the infix expression 10 + 2 - 8 + 3 to postfix using stack and count the number of *push* and *pop* operations required. [6]

17. Write short notes on any ***two*** of the following:

a) Insertion operation in AVL Tree [5]

b) Kruskal's Algorithm [5]

c) Insertion Sort [5]

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