Code No. : 13212 S

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
B.E. (CSE: CBCS) III-Semester Supplementary Examinations, June-2019
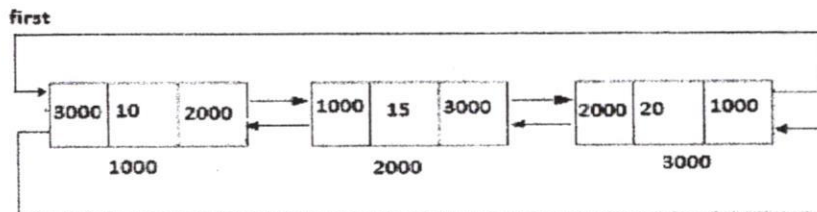### Data Structures

Time: **3** hours

Max. Marks: **60**

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

Part-A (10 × 2 = 20 Marks)

1. What is the matrix which has more number of zero entries? How it can be represented efficiently.

2. Determine the time complexity of the following C function.

    ```
    void add( int a[ ][MAX_SIZE], int b[ ][MAX_SIZE], int c [ ][MAX_SIZE],
    int rows, int cols]
    {
        int i, j;
        for(i=0;i<rows;i++)
            for(j=0;j<cols;j++)
                c[i][j]=a[i][j] - b[i][j];
    }
    ```

3. Design a function to double the size of a stack every time when it becomes full .

4. Given the elements stored in doubly linked list as shown below.

    Show how these elements are stored in a singly linked list data structure with the help of a diagram. Also represent the address information in the nodes

5. Write a function to find the number of leaf nodes in a binary tree.

6. Find the minimum cost spanning tree for the given graph using Kruskal's algorithm.
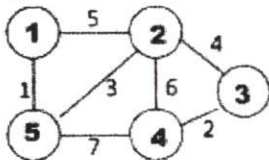

7. Which sorting technique is more suitable for the given data set.
    12   34   56   45   78   89   90

8. What is hashing ? List the hashing techniques.

9. What is the significance of a B- tree ?

10. Design an algorithm to find the balance factor of each node in an AVL tree

Part-B (5 X 8 = 40)
(All Sub-Questions carry equal marks)

11. a) Design a function to insert the element 'n' in the kth position of the linked list.

    b) Write a function to search for an element 'k' in an array of size 'n'.

12. a) What is queue ? How it is implemented using linked list?

    b) Design an algorithm for infix to postfix expression conversion , showing the stack content and output expression after each operator read from the given input expression. (20+30*10)-(e*f+g)/h+i

13. a) Design a function to insert an element into the binary search tree.

    b) Write the algorithm to perform DFS on a given graph. Write the 4 DFS for the following graph from node D.
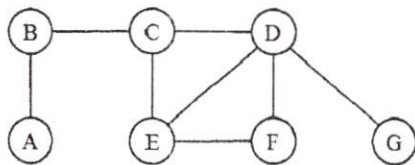
14. a) Design an algorithm to sort the elements using merge sort technique.

    b) Given the hash function h=key mod 10, where 10 is the size of the hash table. Insert the following data into hash table. Use linear probing to address the collisions.
    25, 146, 304, 110, 550, 696, 88, 28, 97, 76

15. a) What is splay tree ? Explain inserting an element into a splay tree with example.

    b) Construct an AVL tree by specifying the type of the rotations performed while inserting elements
    10 25 45 12 20 15 25

16. a) Explain the space and time complexities of an algorithm with example.

    b) Given the attributes of employee, emp_id, emp_name, emp_designation, and emp_salary . Write a program to accept 'n' employee details as input and store their details in a linked list. Also display the details of the employees who are earning more than Rs.20000.

17.   Answer any *two* of the following:

    a) Write a function for inorder and preorder traversal of a Binary tree

    b) Show the heap structure and sequence of elements during each iteration of heap sort algorithm when applied to following set of elements.
    45   125 150 80 40 95 15 450 100

    c) Explain inserting an element into a B-tree with example.