

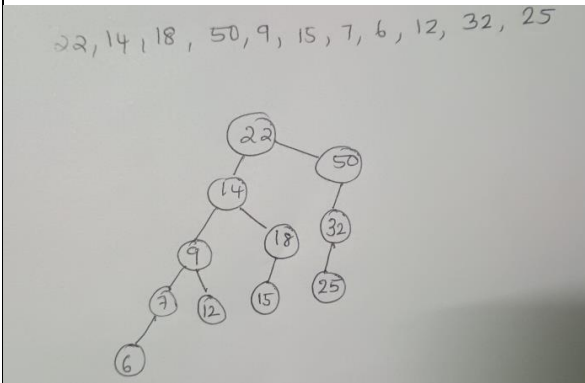
Sub:	DATA STRUCTURES AND APPLICATIONS	Sub Code:	BCS304
Date:	Duration: 90 minutes	Max Marks:	50
		Sem/Sec:	III A,B,C

Scheme and Solutions

Construct a binary search tree for the inputs 22, 14, 18, 50, 9, 15, 7, 6, 12, 32, 25 also write a function in C to search an item in the BST.

Answer:

Construction of BST-3M(step wise)



Search an item in the BST-3M

```

struct node * search ( struct node * root, int key )
{
  if ( root == NULL )
    return root;

  else if ( key == root->data )
    return root;

  else if ( key < root->data )
    search ( root->left, key )

  else if ( key > root->data )
    search ( root->right, key )

}
  
```

1 a

Explain winner tree and loser tree with suitable examples.

Answer:

b

Winner Tree Explanation with example-2M

Looser Tree Explanation with example-2M

Construct a binary tree by using the following in-order and pre-order traversal.

In-order: BCAEDGHFI

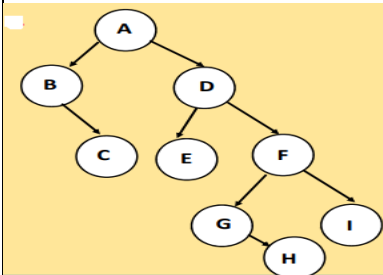
Pre-order: ABCDEFGHI

Also perform the post order traversal of the tree.

Answer:

Construction of Binary Tree-3M

a



Postorder-1M CBEHGIFDA

Demonstrate the tree, data, and array representation for the disjoint sets,

$S_1 = \{1, 2, 5, 7\}$

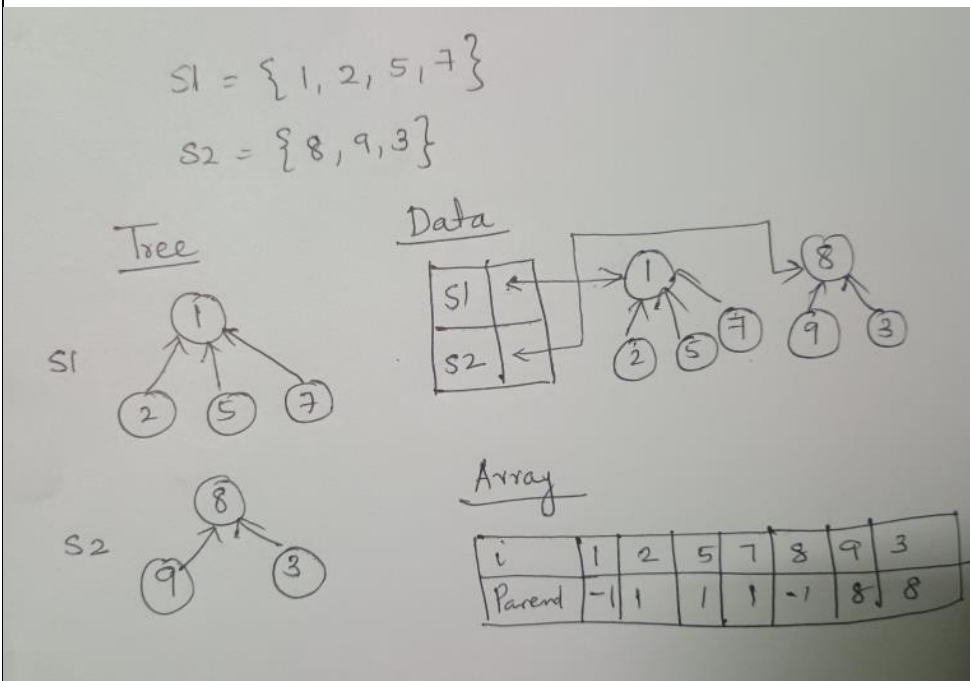
$S_2 = \{8, 9, 3\}$. Also write algorithm for simple union () and simple find().

Answer:

of tree, data, Representation array -1M,2M,1M

2

b



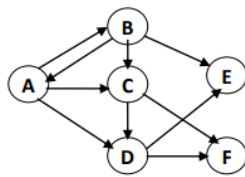
simple union()- 1M

```
void simpleUnion (int i, int j)
{
    Parent [i] = j;
}
```

simple find()- 1M

```
find (i)
{
    while (P[i] >= 0)
    {
        i = P[i];
    }
    return i;
}
```

Define Graph. For the given graph, show all the three representations of the graph.



3

a

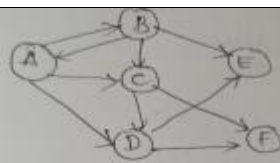
Answer:

Representation of graph

Adjacency Matrix 1M

Adjacency List 2M

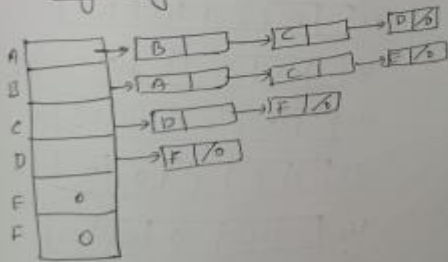
Adjacency Multilist 2M



Adjacency Matrix

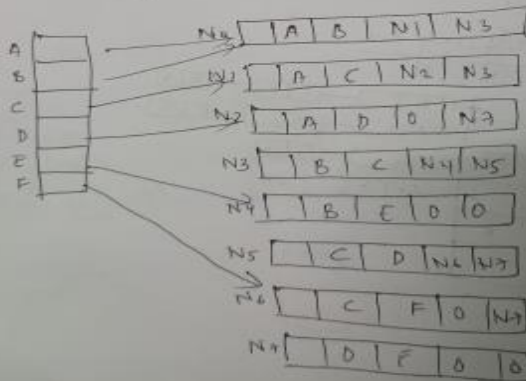
	A	B	C	D	E	F
A	0	1	1	1	0	0
B	1	0	1	0	1	0
C	0	0	0	1	0	1
D	0	0	0	0	0	1
E	0	0	0	0	0	0
F	0	0	0	0	0	0

Adjacency List



Adjacency Multiset

A, B	N ₀
A, C	N ₁
A, D	N ₂
B, A	
B, C	N ₃
B, E	N ₄
C, D	N ₅
C, F	N ₆
D, F	N ₇



What are the methods used for traversing a graph? Explain any one with example and write C function for the same.

Answer:

b

Methods for Traversing -- 1M

DFS (Depth First Search) BFS (Breadth First Search)

Algorithm for DFS or BFS 2M

```

Algorithm DFS(Vertex V)
visited[V] = 1
for all vertex w adjacent
to V:
    if (visited[w] == 0)
        DFS(w);

```

```

Algorithm BFS(V)
{
    A BFS of G(V,E) is carried out
    beginning at vertex V and array visited
    of n initially set to false
    visited[V] = true;
    initialize Queue(Q);
    add(Q,V);
    while {not empty Queue(Q) do
    {
        v = delete(Q,V);
        for all vertexu adjacent to v
        {
            if not visited[w] then
            {
                add(Q,w);
                visited[w] = true;
            }
        }
    }
}

```

Example 2M

Given a hash table with 9 slots. The hash function is $h(k) = k \bmod 9$. The collision is overcome by chaining. The following keys are inserted in the order. 5,28,19,15,20,33,12,17,10. Develop the corresponding hash table.

Answer:

4 a

$h(k) = k \bmod 9$
 5, 28, 19, 15, 20, 33, 12, 17, 10

$5 \bmod 9 = 5$
 $28 \bmod 9 = 1$
 $19 \bmod 9 = 1$
 $15 \bmod 9 = 6$
 $20 \bmod 9 = 2$
 $33 \bmod 9 = 6$
 $12 \bmod 9 = 3$
 $17 \bmod 9 = 8$
 $10 \bmod 9 = 1$

Explain the following by taking suitable examples,
 a) Linear Probing b) Quadratic Probing c) Folding Method

Answer:

- b **Linear Probing technique with example-2M**
- Quadratic Probing technique with example-2M**
- Folding technique with example- 2M**

Explain dynamic hashing using directories with the help of an example.

Answer:

Dynamic hashing using Directories 2M

- a -Importance of directory and buckets
- Increasing depth of the directory.

Example 3M

Differentiate between height biased and weight biased leftist tree with examples.

Answer:

- b **Height biased leftist tree 2.5M**
- Weight biased leftist tree 2.5M**

What is the need for an optimal BST. Find the optimal BST for n=4,

- a Keys are 10,15,20, 25.
- p1, p2, p3, p4 =3,3,1,1

$q_0, q_1, q_2, q_3, q_4 = 2, 3, 1, 1, 1$

Answer:

Need for BST-2M

Problem-8M

$W(i,i) = q(i)$
 $C(i,i) = 0$
 $\lambda(i,i) = 0$

	0	1	2	3	4
0	$W_{00} = 2$ $C_{00} = 0$ $\lambda_{00} = 0$	$W_{11} = 3$ $C_{11} = 0$ $\lambda_{11} = 0$	$W_{22} = 1$ $C_{22} = 0$ $\lambda_{22} = 0$	$W_{33} = 1$ $C_{33} = 0$ $\lambda_{33} = 0$	$W_{44} = 1$ $C_{44} = 0$ $\lambda_{44} = 0$
1	$W_{01} = 8$ $C_{01} = 8$ $\lambda_{01} = 1$	$W_{12} = 7$ $C_{12} = 7$ $\lambda_{12} = 2$	$W_{23} = 3$ $C_{23} = 3$ $\lambda_{23} = 3$	$W_{34} = 3$ $C_{34} = 3$ $\lambda_{34} = 4$	
2	$W_{02} = 12$ $C_{02} = 12$ $\lambda_{02} = 1$	$W_{13} = 9$ $C_{13} = 12$ $\lambda_{13} = 2$	$W_{24} = 5$ $C_{24} = 8$ $\lambda_{24} = 3$		
3	$W_{03} = 14$ $C_{03} = 25$ $\lambda_{03} = 2$	$W_{14} = 11$ $C_{14} = 19$ $\lambda_{14} = 2$			
4	$W_{04} = 16$ $C_{04} = 22$ $\lambda_{04} = 2$				

