1- What is Breadth First Search(BFS) Traversal and Depth First Search(DFS) Traversal?

Or

How to construct BFS Tree and DFS Tree for a given graph?

Or

How to find the shortest path in an undirected unweighted connected graph using BFS?

Learn

2- How to construct a Binary Search Tree using Preorder/Postorder?

Or

Can we construct a unique Tree using Preorder/Postorder?

Learn

3- What is Queue and Stack?

Learn

4- What is Max Heap/ Min Heap?

Or

What is Complete Binary Tree?

Learn

5- What is Topological Ordering?

Learn

6- How to construct an Expression Tree for a given Postfix/Prefix expression?

Learn

7- What are the minimum and maximum number of nodes that can be inserted in a binary tree of given hight ‘h’?

Learn

8- What is Young Tableau Puzzle?

Learn

9- What is Hash Table and Hash Function?

Or

What is Open Addressing and Linear Probing?

Learn

10- What is Load Factor in Hash Table?

Learn

11- What is Infix, Prefix and Postfix expression?

Learn

12- What is Priority Queue?

Learn

13- Height of a Binary Tree.

Or

Height of a Binary Tree using Recursion.

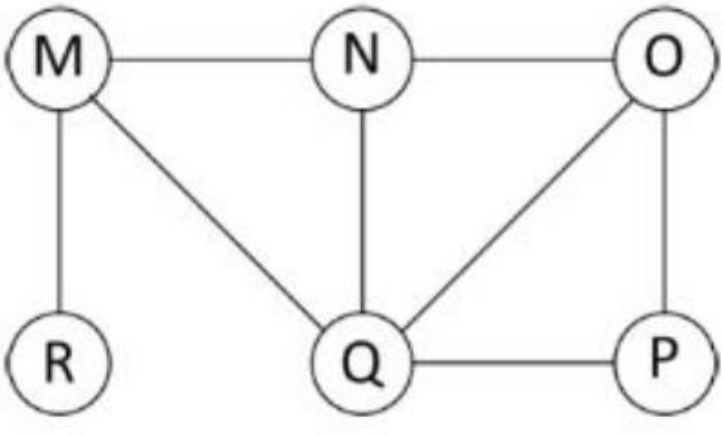
Learn

14- What is Circular Queue?

Learn

Q1- Topic:- BFS/DFS

Breath First Search(BFS) has been implemented using queue data structure.



Which one of the following is a possible order of visiting the nodes in the graph above.
(A) MNOPQR
(B) NQMPOR
(C) QMNROP
(D) POQNMR

Option: D

Solution

Q2- Topic:- Preorder/ Postorder

The pre-order traversal of a binary search tree is given by 12, 8, 6, 2, 7, 9, 10, 16, 15, 19, 17, 20.

Then the post-order traversal of this tree is:

(A) 2, 6, 7, 8, 9, 10, 12, 15, 16, 17, 19, 20
(B) 2, 7, 6, 10, 9, 8, 15, 17, 20, 19, 16, 12

(C) 7, 2, 6, 8, 9, 10, 20, 17, 19, 15, 16, 12

(D) 7, 6, 2, 10, 9, 8, 15, 16, 17, 20, 19, 12

Option: B

Solution

Q3- Topic:- Queue + Stack

Let Q denote a queue containing sixteen numbers and S be an empty stack. Head(Q) returns the element at the head of the queue Q **without** removing it from Q. Similarly Top(S) returns the element at the top of S **without** removing it from S. Consider the algorithm given below.

```
while Q is not Empty do
  if S is Empty OR Top(S) ≤ Head (Q) then
     x:= Dequeue (Q);
     Push (S, x);
```

```
  else
     x:= Pop(S);
     Enqueue (Q, x);
  end
 end
```

The maximum possible number of iterations of the while loop in the algorithm is_____.

Answer: 256

Solution

Q4- Topic:- Min Heap

A complete binary min-heap is made by including each integer in [1, 1023] exactly once. The depth of a node in the heap is the length of the path from the root of the heap to that node. Thus, the root is at depth 0. The maximum depth at which integer 9 can appear is _____

(A) 6

(B) 7

(C) 8

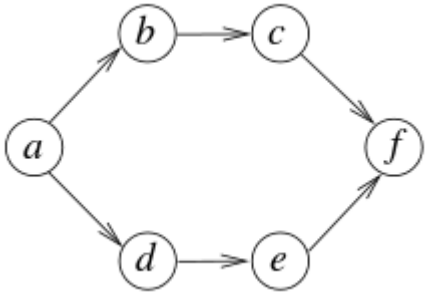
(D) 9

Option: C

Solution

Q5- Topic:- Topological Order

Consider the following directed graph.



The number of different topological orderings of the vertices of the graph is_____.

Answer: 6

Solution

Q6- Topic:- Breadth First Search

Breadth First Search (BFS) is started on a binary tree beginning from the root vertex. There is a vertex t at a distance four from the root. If t is the n-th vertex in this BFS traversal, then the maximum possible value of n is _____.

Answer: 31

Solution

Q7- Topic:- New Order Traversal

Consider the following New-order strategy for traversing a binary tree:

Visit the root;
Visit the right subtree using New-order
Visit the left subtree using New-order

The New-order traversal of the expression tree corresponding to the reverse polish expression **3 4 * 5 – 2 ^ 6 7 * 1 + –** is given by:
(A) + – 1 6 7 * 2 ^ 5 – 3 4 *
(B) – + 1 * 6 7 ^ 2 – 5 * 3 4
(C) – + 1 * 7 6 ^ 2 – 5 * 4 3
(D) 1 7 6 * + 2 5 4 3 * – ^ –

Option: C

Solution

Q8- Topic:- Binary Search Tree

The number of ways in which the numbers 1, 2, 3, 4, 5, 6, 7 can be inserted in an empty binary search tree, such that the resulting tree has height 6, is
_____

Note: The height of a tree with a single node is 0.

Answer: 64

Solution

Q9- Topic:- Binary Tree

The height of a tree is the length of the longest root-to-leaf path in it. The maximum and minimum number of nodes in a binary tree of height 5 are
(A) 63 and 6, respectively
(B) 64 and 5, respectively

(C) 32 and 6, respectively
(D) 31 and 5, respectively

Option: A

Solution

Q10- Topic:- Max Heap

Consider a max heap, represented by the array: 40, 30, 20, 10, 15, 16, 17, 8, 4. Now consider that a value 35 is inserted into this heap. After insertion, the new heap is
(A) 40, 30, 20, 10, 15, 16, 17, 8, 4, 35
(B) 40, 35, 20, 10, 30, 16, 17, 8, 4, 15
(C) 40, 30, 20, 10, 35, 16, 17, 8, 4, 15
(D) 40, 35, 20, 10, 15, 16, 17, 8, 4, 30

Option: B

Solution

Q11- Topic:- Hash Function

Which one of the following hash functions on integers will distribute keys most uniformly over 10 buckets numbered 0 to 9 for i ranging from 0 to 2020?

(A) $h(i) = (12 * i) \bmod 10$
(B) $h(i) = (11 * i^2) \bmod 10$
(C) $h(i) = i^3 \bmod 10$
(D) $h(i) = i^2 \bmod 10$

Option: C

Solution

Q12- Topic:- Young Tableau

A Young tableau is a 2D array of integers increasing from left to right and from top to bottom. Any unfilled entries are marked with ∞, and hence there cannot be any entry to the right of, or below a ∞. The following Young tableau consists of unique entries.

1	2	5	14
3	4	6	23
10	12	18	25
31	∞	∞	∞

When an element is removed from a Young tableau, other elements should be moved into its place so that the resulting table is still a Young tableau (unfilled entries may be filled in with a ∞). The minimum number of entries (other than 1) to be shifted, to remove 1 from the given Young tableau is _____
(A) 2
(B) 5
(C) 6
(D) 18

Option: B

Solution

Q13- Topic:- Load Factor

Given a hash table T with 25 slots that stores 2000 elements, the load factor α for T is _____.

(A) 80
(B) 0.0125

(C) 8000
(D) 1.25

Option: A

Solution

Q14- Topic:- Max Heap

Consider the following array of elements. ⟨89, 19, 50, 17, 12, 15, 2, 5, 7, 11, 6, 9, 100⟩. The minimum number of interchanges needed to convert it into a max-heap is

(A) 4
(B) 5
(C) 2
(D) 3

Option: D

Solution

Q15- Topic:- Binary Search Tree

While inserting the elements 71, 65, 84, 69, 67, 83 in an empty binary search tree (BST) in the sequence shown, the element in the lowest level is

(A) 65
(B) 67
(C) 69
(D) 83

Option: B

Solution

Q16- Topic:- Postfix Expression

The result evaluating the postfix expression 10 5 + 60 6 / * 8 – is

(A) 284
(B) 213
(C) 142
(D) 71

Option: C

Solution

Q17- Topic:- Binary Tree

Consider a binary tree T that has 200 leaf nodes. Then, the number of nodes in T that have exactly two children are _____.

(A) 199
(B) 200
(C) Any number between 0 and 199
(D) Any number between 100 and 200

Option: A

Solution

Q18- Topic:- Shortest Path Using BFS

Consider the tree arcs of a BFS traversal from a source node W in an unweighted, connected, undirected graph. The tree T formed by the tree arcs is a data structure for computing.

(A) the shortest path between every pair of vertices.
(B) the shortest path from W to every vertex in the graph.
(C) the shortest paths from W to only those nodes that are leaves of T.
(D) the longest path in the graph

Option: B

Solution

Q19- Topic:- Priority Queue

A priority queue is implemented as a Max-Heap. Initially, it has 5 elements. The level-order traversal of the heap is: 10, 8, 5, 3, 2. Two new elements 1 and 7 are inserted into the heap in that order. The level-order traversal of the heap after the insertion of the elements is:

(A) 10, 8, 7, 3, 2, 1, 5
(B) 10, 8, 7, 2, 3, 1, 5
(C) 10, 8, 7, 1, 2, 3, 5
(D) 10, 8, 7, 5, 3, 2, 1

Option:- A

Solution

Q20- Topic:- Hash Table

Consider a hash table with 9 slots. The hash function is $h(k) = k \bmod 9$. The collisions are resolved by chaining. The following 9 keys are inserted in the order: 5, 28, 19, 15, 20, 33, 12, 17, 10. The maximum, minimum, and average chain lengths in the hash table, respectively, are-

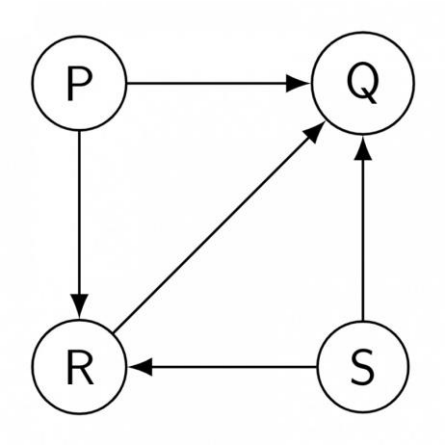
(A) 3, 0, and 1
(B) 3, 3, and 3
(C) 4, 0, and 1
(D) 3, 0, and 2

Option: A

Solution

Q21- Topic:- Topological Order

Consider the directed graph given below. Which one of the following is TRUE?



(A) The graph doesn't have any topological ordering
(B) Both PQRS and SRPQ are topological ordering
(C) Both PSRQ and SPRQ are topological ordering
(D) PSRQ is the only topological ordering

Option: C

Solution

Q22- Topic:- Circular Queue

Suppose a circular queue of capacity (n – 1) elements is implemented with an array of n elements. Assume that the insertion and deletion operation are carried out using REAR and FRONT as array index variables, respectively. Initially, REAR = FRONT = 0. The conditions to detect queue full and queue empty are-

(A) Full: (REAR+1) mod n == FRONT, empty: REAR == FRONT
(B) Full: (REAR+1) mod n == FRONT, empty: (FRONT+1) mod n == REAR
(C) Full: REAR == FRONT, empty: (REAR+1) mod n == FRONT
(D) Full: (FRONT+1) mod n == REAR, empty: REAR == FRONT

Option: A

Solution

Q23- Topic:- Binary Tree

The height of a tree is defined as the number of edges on the longest path in the tree. The function shown in the pseudocode below is invoked as height (root) to compute the height of a binary tree rooted at the tree pointer root.

```
int height (treeptr n)
{ if (n== NULL) return -1;
  if (n → left == NULL)
        if (n → right ==NULL) return 0;
        else return [B1];                          // Box 1
else {h1 = height (n → left);
        if (n → right == NULL) return (1 + h1);
        else {h2 = height (n → right);
                return [B2] ;                      // Box 2
                }
        }
}
```

The appropriate expression for the two boxes B1 and B2 are-

(A) B1 : (1 + height(n->right)), B2 : (1 + max(h1,h2))
(B) B1 : (height(n->right)), B2 : (1 + max(h1,h2))
(C) B1 : height(n->right), B2 : max(h1,h2)
(D) B1 : (1 + height(n->right)), B2 : max(h1,h2)

Option: A

Solution

Q24- Topic:- Preorder/ Postorder

The preorder traversal sequence of a binary search tree is 30, 20, 10, 15, 25, 23, 39, 35, 42. Which one of the following is the postorder traversal sequence of the same tree?

(A) 10, 20, 15, 23, 25, 35, 42, 39, 30
(B) 15, 10, 25, 23, 20, 42, 35, 39, 30
(C) 15, 20, 10, 23, 25, 42, 35, 39, 30
(D) 15, 10, 23, 25, 20, 35, 42, 39, 30

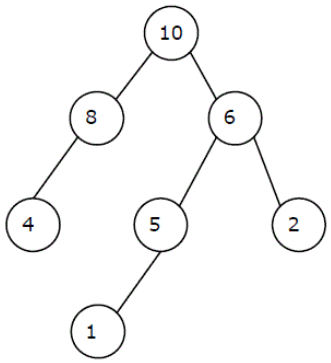
Option: D

[Solution]

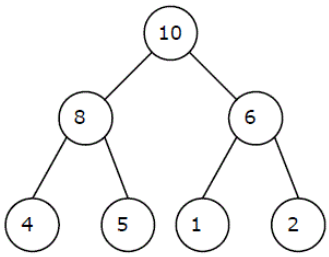
Q25- Topic:- Max Heap

A max-heap is a heap where the value of each parent is greater than or equal to the values of its children. Which of the following is a max-heap?

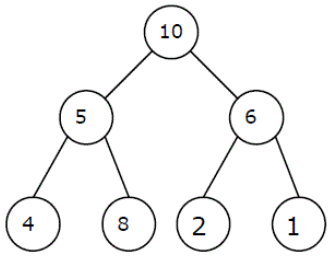
(A)



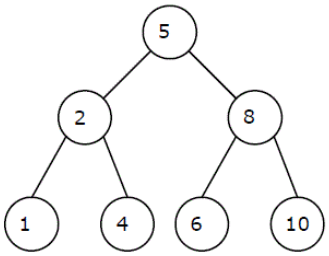
(B)



(C)



(D)



(A) A
(B) B
(C) C
(D) D

Option: B

[Solution]

Q26- Topic:- Binary Search Tree

We are given a set of n distinct elements and an unlabelled binary tree with n nodes. In how many ways can we populate the tree with the given set so that it becomes a binary search tree?

(A) 0

(B) 1

(C) n!

(D) (1/(n+1)).2nCn

Option: B

Solution

Q27- Topic:- Linked List

The following C function takes a simply-linked list as input argument. It modifies the list by moving the last element to the front of the list and returns the modified list. Some part of the code is left blank. Choose the correct alternative to replace the blank line.

```
typedef struct node
{
int value;
struct node *next;
}Node;

Node *move_to_front(Node *head)
```

```
{
Node *p, *q;
if ((head == NULL: || (head->next == NULL))
return head;
q = NULL; p = head;
while (p-> next !=NULL)
{
q = p;
p = p->next;
}
_____
return head;
}
```

(A) q = NULL; p->next = head; head = p;

(B) q->next = NULL; head = p; p->next = head;

(C) head = p; p->next = q; q->next = NULL;

(D) q->next = NULL; p->next = head; head = p;

Option: D

Solution

Q28- Topic:- Binary Tree

In a binary tree with n nodes, every node has an odd number of descendants. Every node is considered to be its own descendant. What is the number of nodes in the tree that have exactly one child?

(A) 0
(B) 1
(C) (n-1)/2
(D) n-1

Option: A

Solution

Q29- Topic:- Spanning Tree

Consider a complete undirected graph with vertex set {0, 1, 2, 3, 4}. Entry Wij in the matrix W below is the weight of the edge {i, j}.

$$W = \begin{pmatrix} 0 & 1 & 8 & 1 & 4 \\ 1 & 0 & 12 & 4 & 9 \\ 8 & 12 & 0 & 7 & 3 \\ 1 & 4 & 7 & 0 & 2 \\ 4 & 9 & 3 & 2 & 0 \end{pmatrix}$$

What is the minimum possible weight of a spanning tree T in this graph such that vertex 0 is a leaf node in the tree T?

(A) 7
(B) 8
(C) 9
(D) 10

Option: D

Solution

Q30- Topic:- Hash Table

A hash table of length 10 uses open addressing with hash function h(k)=k mod 10, and linear probing. After inserting 6 values into an empty hash table, the table is as shown below.

0	
1	
2	42
3	23
4	34
5	52
6	46
7	33
8	
9	

Which one of the following choices gives a possible order in which the key values could have been inserted in the table?

(A) 46, 42, 34, 52, 23, 33
(B) 34, 42, 23, 52, 33, 46
(C) 46, 34, 42, 23, 52, 33
(D) 42, 46, 33, 23, 34, 52

Option: C

Solution

Q31- Topic:- Hash Table

How many different insertion sequences of the key values using the same hash function and linear probing will result in the hash table shown above?

(A) 10
(B) 20
(C) 30
(D) 40

Option: C

Solution