b.i. Explain the insertion and deletion operation in circular queue with example. (8 Marks)

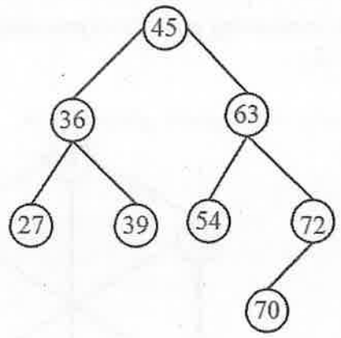
ii. Elaborate the operations of Deque. (4 Marks)

31. a. Construct the binary search tree T with following elements 45, 39, 56, 12, 34, 78, 32, 10, 89, 54, 67 and 81. Find the result of in-order, pre-order and post-order traversal of T.

**(OR)**

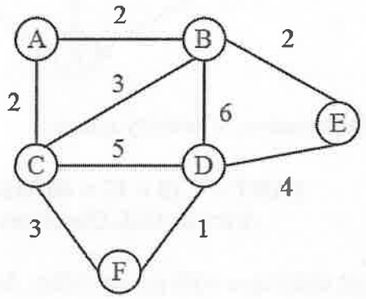
b.i. Consider the AVL tree given below and insert 18, 81, 29, 15, 19, 25, 26 and 1 in it. (8 Marks)

ii. Delete node 39, 63, 15 and 1 from AVL tree formed after above inserted nodes.




(4 Marks)

32. a. Construct the minimum spanning tree using Kruskal's algorithm for the following graph.




**(OR)**

b.i. Consider a hash table of size 10. Using quadratic probing, insert the keys 27, 72, 63, 42, 36, 18, 29, 101 into the table. Take $C_1 = 1$ and $C_2 = 3$. (8 Marks)

ii. List the pros and cons of linear probing. (4 Marks)

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**B.Tech. DEGREE EXAMINATION, NOVEMBER 2018**
3rd to 7th Semester

15CS201J – DATA STRUCTURES
*(For the candidates admitted during the academic year 2015-2016 to 2017-2018)*

**Note:**
(i) **Part - A** should be answered in OMR sheet within first 45 minutes and OMR sheet should be handed over to hall invigilator at the end of 45th minute.
(ii) **Part - B** and **Part - C** should be answered in answer booklet.

Time: Three Hours Max. Marks: 100

**PART – A (20 × 1 = 20 Marks)**
Answer **ALL** Questions

1. The worst case time complexity of binary search algorithm is
(A) O (n) (B) O ($n^2$)
(C) O (n log n) (D) O (log n)

2. Which of the following cases occurs when searching an array using linear search the value to be searched is equal to the first element of the array?
(A) Worst case (B) Average case
(C) Best case (D) Amortized case

3. The number interchange required to sort 1, 2, 7, 12, 9 in descending order using insertion sort is
(A) 5 (B) 8
(C) 9 (D) 10

4. Which one of the following is a primitive data type?
(A) Integer (B) Priority queue
(C) Circular linked list (D) Array

5. Three-fields will be there in _____ type of linked list.
(A) Singly linked list (B) Double linked list
(C) Circular linked list (D) Circular queue

6. _____ matrix has more number of elements as zero than non-zero elements.
(A) Diagonal (B) Singular
(C) Triangular (D) Sparse

7. Linked list are suitable for all except _____.
(A) Binary search (B) Linear search
(C) Radix sort (D) Insertion sort

8. If an array is declared as *arr [ ] = {1, 3, 5, 7, 9}* then what is the value for size of *(arr [3])*?
(A) 1 (B) 2
(C) 3 (D) 8

9. Reverse polish notation is the other name for
   (A) Infix expression (B) Prefix expression
   (C) Postfix expression (D) Algebraic expression

10. Time complexity for operations on queue is
   (A) O (1) (B) O (n)
   (C) O (log n) (D) O ($n^2$)

11. The queue will be full only when.
   (A) Front = max −1 and rear = max −1 (B) Front = 0 and rear = max −1
   (C) Front = max −1 and rear = 0 (D) Front = 0 and rear = 0

12. _____ is used in non-recursive implementation of recursive algorithm.
   (A) Stack (B) Queue
   (C) Array (D) Tree

13. Total number of nodes at the $n^{th}$ level of a binary tree can be given as
   (A) 2n (B) $2^n$
   (C) $2^{n+1}$ (D) $2^{n-1}$

14. How much time does an AVL tree take to perform search, insert and delete operations in the average case as well as the worst case?
   (A) O (n) (B) O (log n)
   (C) O ($n^2$) (D) O (n log n)

15. When a node N is accessed, it is splayed to make it as
   (A) Root node (B) Parent node
   (C) Child node (D) Sibling node

16. Every node in a B-tree has at most _____ children.
   (A) M (B) M −1
   (C) 2 (D) M + 1

17. In the worst case, how much time does it take to build a binary heap of n elements?
   (A) O (n) (B) O (log n)
   (C) O (n log n) (D) O ($n^2$)

18. How many nodes does a binomial tree of order O have?
   (A) 0 (B) 1
   (C) 2 (D) 3

19. A graph in which there exists a path between any two of its nodes is called
   (A) Complete graph (B) Connected graph
   (C) Digraph (D) In-directed graph

20. Which open addressing technique is free from clustering problems?
   (A) Linear probing (B) Quadratic probing
   (C) Double hashing (D) Rehashing



**PART – B (5 × 4 = 20 Marks)**
Answer **ANY FIVE** Questions

21. Brief about the complexity of and space-time trade-off of an algorithm.

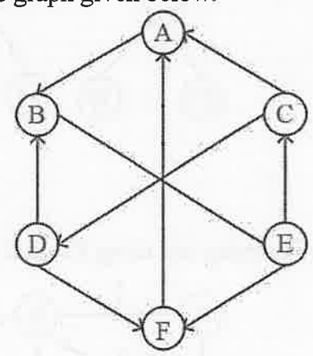
22. List out the differences between array and linked list.

23. Mention the types of queue. Differentiate priority queue with dequeue.

24. Brief about the properties of a red-black tree.

25. Write the algorithm for evaluating an infix expression and evaluate the expression
   $18 - ((7 * 2) + 4) / 2$

26. Find the adjacency matrix of the graph given below.




27. Write about the implementation of priority queue.

**PART – C (5 × 12 = 60 Marks)**
Answer **ALL** Questions

28. a. Illustrate insertion sort technique with an algorithm. Mention the time complexity.

**(OR)**

b. Discuss the asymptotic notations with examples.

29. a. Given two polynomials represented by a linked list $7x^3 + 4x^2 + 2$ and $15x + 9$, write a procedure that add two polynomials.

**(OR)**

b. Discuss the following operations of doubly linked list with an example
   (i) Inserting a node after a given node
   (ii) Deleting a node at the end
   (iii) Deleting a node before a given node

30. a.i. Convert the given expression to postfix expression $A - (B / C + (D\%E * F) / G) * H$. (8 Marks)

ii. Evaluate the prefix expression given below and write the result $+ - 927 * 8 / 4$ 12. (4 Marks)

**(OR)**