b.i. Explain the priority queue with an example.

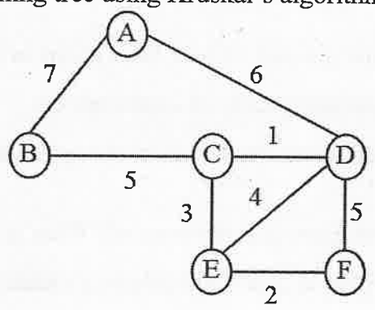
ii. Explain the Dequeue operation performed in circular queue with example.

31. a. Explain the various rotations of AVL tree with a set of inputs.

(OR)

b. Construct the red black tree for the following input list: 195, 95, 65, 13, 65, 10, 25, 2.

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



(OR)

b. Consider a hash table of size 10. Using quadratic probing, insert the keys 75, 27, 36. 24. 63. 81 and 101 into the table. Consider C_1=1 and C_2=3.

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Reg. No.														

B.Tech. DEGREE EXAMINATION, DECEMBER 2019
First to Eighth 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. Which of the following is not a primitive data structure?
(A) Boolean (B) Integer
(C) Arrays (D) Character

2. ____of a set of N elements is an arrangement of the elements in a given order
(A) Combination (B) Permutation
(C) Exponent (D) Logarithm

3. The complexity of linear search algorithm is
(A) O(n) (B) $O(n^2)$
(C) O(n log n) (D) O (log n)

4. An ADT is defined to be a mathematical model of a user defined type along with the collections of all _____ operations on that model.
(A) Cardinality (B) Assignment
(C) Primitive (D) Structure

5. Which one of the following data structure is called as self-referential data type?
(A) Linked list (B) Array
(C) Stack (D) Trees

6. Each node in a linked list must contain at least _____.
(A) Three fields (B) Two fields
(C) Four fields (D) Five fields

7. Which one of the following operations is performed more effectively by doubly linked list than by singly linked list?
(A) Deleting a node whose location is given (B) Searching of an unsorted list given
(C) Inverting a node after the node with given location (D) Traversing a list to process each node

8. _____is a technique which periodically collects all the deleted space onto free storage list?
   (A) Garbage collection (B) Linked list
   (C) Free storage (D) Garbage compaction

9. When new data are to be inserted into a data structure, but there is no available space, this situation is usually called
   (A) Underflow (B) Overflow
   (C) House full (D) Saturator

10. Identify the data structure which allows deletion at both ends but insertion at only one end is called
   (A) Input restricted dequeue (B) Output restricted dequeue
   (C) Priority queue (D) Stack

11. The result of evaluating the postfix expression 12 3 2 * 6 / +
   (A) 13 (B) 3
   (C) 12 (D) 14

12. Which one of the following permutations can be obtained as output using stack, assuming that the input is 11, 22, 33, 44, 55 in that order
   (A) 33, 44, 55, 11, 22 (B) 33, 44, 55, 22, 11
   (C) 11, 55, 22, 33, 44 (D) 55, 44, 33, 11, 22

13. A binary tree in which if all its levels except possibly the last, have the maximum number of nodes and all the nodes at the last level appear as far as possible, is known as
   (A) Full binary tree (B) AVL tree
   (C) Threaded tree (D) Complete binary tree

14. When the left sub tree of the tree is one level higher than that of right sub tree, then the balance factor is
   (A) 0 (B) 1
   (C) –1 (D) 2

15. Which of the following way is in-order traversal?
   (A) Root → left sub tree → right sub tree (B) Root → right sub tree → left sub tree
   (C) Left sub tree → root → right sub tree (D) Left sub tree → right sub tree → root

16. When inorder traversal of a tree resulted in EACKFHDBG, the preorder traversal would return
   (A) FAEKCDBHG (B) FAEKCDHGB
   (C) FEAKDCHBG (D) EAFKHDCBG

17. The maximum degree of any vertex in a simple graph with N vertices is
   (A) N (B) N+1
   (C) N–1 (D) 2N

18. In _____a direct graph G is a cyclic, if and only if a DFS of G yields no back edge.
   (A) Kruskal's algorithm (B) Prim's algorithm
   (C) Dijstra algorithm (D) Topological sorting

19. Given two vertices S and T in a graph, which of the two traversals (BFS and DFS) can be used to find if there is a path from S to T?
   (A) Only BFS (B) Only DFS
   (C) Both DFS and BFS (D) Neither DFS nor BFS

20. A hash function is defined as f(key) =key MOD 7, with linear probing, is used to insert keys 37, 38, 72, 48, 98, 11, 56 into a table indexed from 0-6, what will be location of key 11?
   (A) 3 (B) 4
   (C) 5 (D) 6

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

21. Define data structure and write in brief about two types of data structures with example.

22. Analyze the time complexity of insertion sort.

23. Why do we need sparse matrix? How the sparse matrices are used efficiently in the computer's memory?

24. Define Dequeue. How is it represented? What are the types of Dequeue?

25. Write an algorithm to insert and delete an element in circular queue.

26. Construct a binary search tree (BST) for the elements: 50, 25, 60, 75, 80. Justify the need for balancing the BST tree.

27. Draw a hash table with open addressing and a size of 9. Use the hash function "K%9". Insert the keys 5, 29, 20, 0, 27 and 18 into your table (in that order).

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

28. a. Write an algorithm for binary search and explain with suitable example. Mention its time complexity.

(OR)

b. Explain the various mathematical notations and functions using a single algorithm for a fixed set of inputs.

29. a. Devise an algorithm to do the following operations on a singly linked list.
   (i) Insert at front
   (ii) Delete at last
   (iii) Search an element

(OR)

b. Given two polynomials represented by a linked list $5x^3 + 4x + 2$ and $5x+3$. Write a procedure to add two polynomials.

30. a. Convert the given expression into prefix expression *(A+B)/(C+D)–(D*E)* and write the algorithm.

(OR)