Question Paper Code | 13290

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024
Third Semester
Electronics and Instrumentation Engineering
(Common to Instrumentation and Control Engineering)
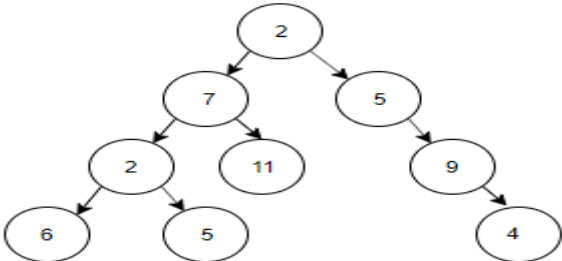### 20ESIT301 - DATA STRUCTURES AND ALGORITHMS
Regulations - 2020

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)
Answer ALL Questions

	Marks	K–Level	CO

1. Which of the following data structure is non-linear type? — 1, K1, CO1
   (a) Strings   (b) Lists   (c) Stacks   (d) None of the above
2. New nodes are added to the _____ of the queue. — 1, K1, CO1
   (a) Front   (b) Back   (c) Middle   (d) Both A and B
3. When a pop() operation is called on an empty queue, what is the condition called? — 1, K1, CO1
   (a) Underflow   (b) Overflow   (c) Syntax Error   (d) Garbage Value
4. Minimum number of fields in each node of a doubly linked list is _____ — 1, K1, CO2
   (a) 2   (b) 3   (c) 4   (d) 5
5. The situation when in a linked list START=NULL is …… — 1, K1, CO2
   (a) Underflow   (b) Overflow   (c) Houseful   (d) Saturated
6. For the tree below, write the in-order traversal — 1, K2, CO2

   (a) 6,2,5,7,11,2,5,9,4   (b) 6,5,2,11,7,4,9,5,2
   (c) 2,7,2,6,5,11,5,9,4   (d) 2,7,6,5,11,2,9,5,4
7. To represent hierarchical relationship between elements, which data structure is suitable? — 1, K1, CO3
   (a) Dequeue   (b) Priority   (c) Tree   (d) Graph
8. If two trees have same structure and but different node content, then they are called _____ — 1, K1, CO3
   (a) Synonyms trees   (b) Joint tree   (c) Equivalent trees   (d) Similar trees
9. The number of edges from the root to the node is called _____ of the tree. — 1, K1, CO3
   (a) Height   (b) Depth   (c) Length   (d) Width
10. The number of edges in a complete graph of n vertices is — 1, K1, CO4
    (a) n(n+1)/2   (b) n(n-2)/2   (c) $n^2/2$ (d) n
11. A graph in which all vertices have equal degree is known as _____ — 1, K1, CO4
    (a) Complete graph   (b) Regular graph   (c) Multi graph   (d) Simple graph
12. In BFS, the traversal starts from, — 1, K1, CO4
    (a) The deepest node   (b) The root node
    (c) The last inserted node   (d) Any arbitrary node
13. The total number of comparisons in a bubble sort is _____ — 1, K1, CO5
    (a) O(n logn)   (b) O(2n)   (c) O(n2)   (d) O(n)

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **13290**

14.	The complexity of linear search algorithm is	*1* K1 CO5

14. The complexity of linear search algorithm is   *1* *K1* *CO5*
(a) O(n)   (b) O(log n)   (c) O(n^2)   (d) O(n log n)

15. In ……………, search start at the beginning of the list and check every element in the list.   *1* *K1* *CO5*
(a) Binary Search   (b) Linear Search   (c) Binary Tree Search   (d) Hash Search

16. What type of sorting algorithm is Insertion Sort?   *1* *K1* *CO5*
(a) Stable   (b) Unstable   (c) Both stable and unstable   (d) None of the above

17. Which collision resolution technique involves placing collided elements in the next available empty slot in the hash table?   *1* *K1* *CO6*
(a) Linear Probing   (b) Quadratic Probing
(c) Separate Chaining   (d) Double Hashing

18. Which data structure often results in a time-space tradeoff by using extra memory to speed up operations?   *1* *K1* *CO6*
(a) Arrays   (b) Linked Lists   (c) Hash Tables   (d) None of the above

19. Consider a hash table of size 7, with hash function H(K)=K%7, and pseudo random i=(i+5)%7. We want to insert the following keys one by one from left to right. 15, 11, 25, 16, 9, 8, 12 What will be the position of the key 25, if we use random probing?   *1* *K1* *CO6*
(a) 4   (b) 5   (c) 1   (d) 2

20. In Extendible Hashing, what data structure is used to manage the directory?   *1* *K1* *CO6*
(a) Binary Tree   (b) Array   (c) Linked List   (d) Hash Table

PART - B (10 × 2 = 20 Marks)
Answer ALL Questions

21. Distinguish between linear and non-linear data structure.   *2* *K2* *CO1*

22. Translate the infix (a+b)*(c+d)/f into postfix expression.   *2* *K2* *CO1*

23. List the basic operations carried out in a linked list.   *2* *K1* *CO2*

24. Define doubly circular linked list.   *2* *K1* *CO2*

25. List the steps involved in deleting a node from a binary search tree.   *2* *K1* *CO3*

26. Differentiate between Binomial Heaps and Fibonacci Heaps.   *2* *K2* *CO3*

27. What is the use of Dijksra's algorithm?   *2* *K1* *CO4*

28. Prove that the maximum number of edges that a graph with vertices is n*(n-1)/2.   *2* *K2* *CO4*

29. Compare Linear Search and Binary Search.   *2* *K2* *CO5*

30. How does insertion sort algorithm work?   *2* *K1* *CO6*

PART - C (6 × 10 = 60 Marks)
Answer ALL Questions

31. a) Explain in detail about the various operations of queue. Write a routine to implement enqueue and dequeue operations.   *10* *K2* *CO1*

OR

b) Write an algorithm to convert an infix expression to a postfix expression. Apply the algorithm to convert infix expression into postfix expression using stack
A +(B*C -(D/E^F)*G)*H   *10* *K2* *CO1*

32. a) Write and explain algorithm to insert element at the beginning of singly Linked list.   *10* *K2* *CO2*

OR

b) Write a routine to insert and delete an element at the beginning in doubly linked circular list with suitable example.   *10* *K2* *CO2*

33. a) Create a binary search tree for the following numbers start from an empty binary search tree. 45, 26, 10, 60, 70, 30, 40 Delete keys 10, 60 and 45 one after the other and show the trees at each stage.   *10* *K3* *CO3*

*K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create*   **13290**

OR

b) Write a routine for AVL tree insertion. Insert the following elements in the empty tree and how do you balance the tree after each element insertion? Elements: 2, 5, 4, 6, 7, 9, 8, 3, 1, 10.   *10 K3 CO3*

34. a) Write and Trace an algorithm for the BFS & DFS of a graph.   *10 K3 CO4*
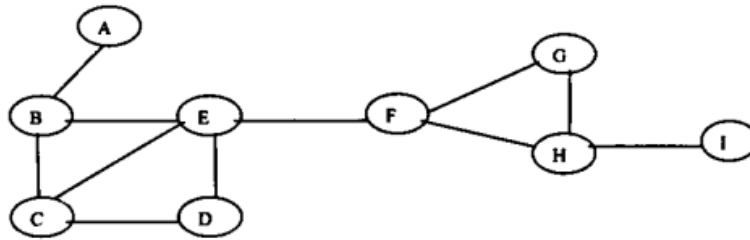
OR

b) Find the Shortest paths in the following weighted graph using Dijkstra's Algorithm.   *10 K3 CO4*
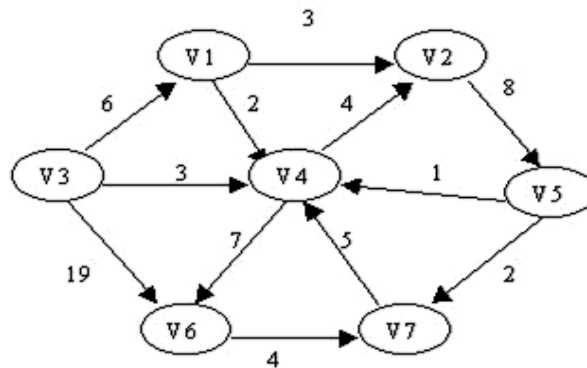
35. a) Test the numbers 7, 1, 4, 12, 67, 33, and 45 for bubble sort and write a program to implement bubble sort. How many swaps will be performed to sort these numbers using the bubble sort?   *10 K2 CO5*

OR

b) Examine an algorithm to search an element in an array using binary search technique with an example.   *10 K2 CO5*

36. a) Discuss the concept of separate chaining in hash tables. Explain how it works, its advantages and disadvantages, and provide an example to illustrate your points.   *10 K2 CO6*

OR

b) The keys 12, 18, 13, 2, 3, 23, 5 and 15 are inserted into an initially empty hash table of length 10 using open addressing with hash function $h(k) = k \bmod 10$ and linear probing. What is the resultant hash table?   *10 K2 CO6*