

VR20



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VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
(AUTONOMOUS)

II/IV B.Tech. DEGREE EXAMINATION, APRIL- 2024

Third Semester

AI&DS

20AI&DS3305 DATA STRUCTURES & ALGORITHMS

Time: 3 hours

Max. Marks: 70

Part-A is compulsory

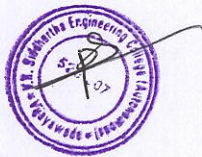
Answer One Question from each Unit of Part - B

Answer to any single question or its part shall be written at one place only

PART-A

10 x 1 = 10M

1.
 - a. Define an abstract data type (ADT). (CO1 K1)
 - b. What is the size of an empty stack? (CO1 K1)
 - c. What is the time complexity for dequeue operation in a queue. (CO2 K2)
 - d. Define a circular linked list. (CO2 K1)
 - e. Convert the following infix expression to postfix: " $3 + 4 * (2 - 1)$ ". (CO2 K2)
 - f. What is the height of a tree? (CO3 K1)
 - g. Build an expression tree for the arithmetic expression " $a = b + c * d$ ". (CO3 K2)
 - h. What is the time complexity of deleting the minimum element from a min heap with 'N' elements? (CO3 K2)
 - i. What is a cycle in a graph? (CO4 K1)
 - j. List the properties of a good hash function. (CO4 K1)



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PART-B

4 x 15 = 60M

UNIT-I

2. a. Demonstrate how the insertion sort algorithm works on the given list.
A: [5, 2, 4, 6, 1, 3]. **(CO1 K2) 8M**
- b. Analyze the time complexity of insertionsort for the best-case, worst-case, and average-case. **(CO1 K3) 7M**

(or)

3. a. Explain the algorithm for evaluating a postfix expression using a stack. **(CO1 K2) 8M**
- b. Demonstrate the evaluation of postfix expression using stack. Postfix Expression: "2 3 1 * + 9 -" **(CO1 K3) 7M**

UNIT-II

4. a. Explain the implementation of a linear queue and its operations. **(CO2 K2) 8M**
- b. Examine the limitations of the linear queue. **(CO2 K3) 7M**

(or)

5. a. Explain the insertion and deletion operations in a circular linked list using appropriate pseudocode. **(CO2 K2) 8M**
- b. Compare and contrast singly linked lists and circular linked lists. **(CO2 K3) 7M**

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UNIT-III

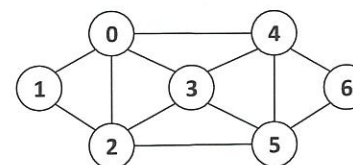
6. a. Construct the Binary search tree by inserting the following values in the given order: 50, 45, 70, 12, 30, 15, 65, 48, 10, and 55. **(CO3 K3) 8M**
- b. Consider the constructed Binary Search Tree from question 6.a. Perform the deletion of nodes with values 55 and 30. Show the resulting tree after each deletion. **(CO3 K3) 7M**

(or)

7. a. Apply the Heap Sort algorithm to sort the given array: [40, 30, 50, 45, 25, 5] and illustrate all the intermediate steps with appropriate figures. **(CO3 K3) 8M**
- b. Explain the properties of the Heap data structure. **(CO3 K2) 7M**

UNIT-IV

8. a. Explain Depth-First Search (DFS) traversal algorithm. **(CO4 K2) 8M**
- b. Demonstrate the step-by-step process of performing DFS traversal on the graph below. Consider the starting node of the graph is 0. **(CO4 K3) 7M**



(or)

9. a. Explain the open addressing collision resolution techniques with a suitable example. **(CO4 K3) 8M**
- b. Explain the various Hash functions in detail. **(CO4 K2) 7M**