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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

December 2023 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: Artificial Intelligence and Machine Learning **Duration: 3 hrs.**
Course Code: 22AM3PCDST **Max Marks: 100**
Course: Data Structures

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Explain malloc(), calloc(), realloc() and free() dynamic memory allocation functions along with their syntax and examples. **10**

b) Write a C program to perform insert front, delete rear and display operations on a Singly Linked List. **10**

UNIT - II

2 a) Using the concept of Stack,

i. Convert the given infix expression: a*b/(c+d)-e^f+g to its equivalent postfix form.
ii. Assign the values a=6, b=3, c=8, d=2, e=3, f=4, g=5 to the resultant postfix form and evaluate the same. **12**

b) Write C functions to perform the following operations on a Circular Doubly Linked List (CDLL)

i. Insert a node at the front end
ii. Count the number of nodes
iii. Search for a given key element
iv. Display **8**

OR

3 a) Convert the given infix expressions to prefix forms.

i. A+B*C-D+E/F/(G+H)
ii. (A+B)*C-D+(E/F)/G+H **10**

During the conversion process, make sure to represent the contents of stack, index value of "top", intermediate infix and prefix expression forms clearly in a tabular fashion.

b) Write C functions to perform the following operations on a Doubly Linked List (DLL) **10**

i. Insert a node at the rear end
ii. Delete node from the front end
iii. Display

UNIT - III

4 a) Automated online food booking system works on the concept of Queue to service the user requests. Assume that the application holds only 10 requests in the queue, chose a suitable data structure and implement the given scenario using the C language. Read the inputs and delete the entries as service progress. **8**

b) Write a recursive C function to

i. Find Greatest Common Divisor (GCD) of two numbers.
ii. Solve Tower-of-Hanoi problem with 3 discs **12**

Show the detailed stack trace with an example for each.

UNIT - IV

5 a) Construct a Binary Search Tree (BST) for the sequence of elements: 68, 34, 56, 78, 23, 12, 1, 5, 89, 10. Write the Post order and Pre order traversal sequences of the resultant tree. **10**

b) Answer the following with respect to a Threaded Binary Tree:

i. How is it different from a regular Binary tree?
ii. Explain its variations using pictorial representations.
iii. Where do you think these types of trees are useful in real time? **10**

UNIT - V

6 a) Construct a Red-Black tree for the given sequence of elements: 20, 95, 25, 80, 30, 70, 40, 34, 12 **10**

b) Explain Splay trees, its rotation types and applications in detail. **10**

OR

7 a) Construct an AVL tree for the given sequence of elements: 60, 23, 45, 22, 12, 34, 56, 78, 65,90. Show the intermediate steps clearly and explain the reason for applying rotation during the tree construction phase wherever it is necessary. **10**

b) Write algorithmic steps followed during construction of a Red-Black tree and detail the procedure by creating a tree of your own. **10**

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