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17CS33

Third Semester B.E. Degree Examination, July/August 2022
Data Structures and Applications

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define data structures. Give its classifications. **(05 Marks)**
 b. Explain the functions supported by C to carry out dynamic memory allocation. Design a function to create 2D array dynamically. **(10 Marks)**
 c. Explain with example: i) Structures and Unions. **(05 Marks)**

OR

2 a. Define polynomial. How would you represent two polynomials using array of structures? Design a function to add two polynomials and store the result in the same array. **(10 Marks)**
 b. Construct an algorithm to sort 'n' integers using bubble sort and estimate its efficiency. **(05 Marks)**
 c. Design an algorithm to search pattern string 'p' in the text string 'T' using an automata. **(05 Marks)**

Module-2

3 a. Define stack. List and implement the different operations on stack. **(10 Marks)**
 b. Construct an algorithm to evaluate valid postfix expression and hence evaluate the postfix expression 623 + - 382/+ *. All operands are single digit positive integers and operators are binary in nature. **(10 Marks)**

OR

4 a. Give disadvantages of ordinary queue and how it is solved in circular queue. Explain with suitable example how you would implement circular queue using dynamically allocated arrays. **(10 Marks)**
 b. Define Recursion. Design a recursive algorithm for the following:
     i)   Factorial of a given number
     ii)   Tower of Hanoi. **(10 Marks)**

Module-3

5 a. Give the node structure to create a singly limited list of integers and write a function to perform the following:
     i)   Create a two node list.
     ii)   Printing a list.
     iii)   To search an item in the list. **(10 Marks)**
 b. Write a C function to perform the following:
     i)   Reversing a singly linked list.
     ii)   Concatenating a singly linked list. **(10 Marks)**

OR

6 a. Explain with suitable 'C' representation, linked stack and linked queue. **(10 Marks)**
   b. Write a node structure for doubly linked list and write a function to perform the following:
      i)   Insertion into a doubly linked circular list.
      ii) Deletion from a doubly linked circular list. **(10 Marks)**

Module-4

7 a. Define tree and write the
      i)   List representation
      ii) Leftchild-right sibling representation
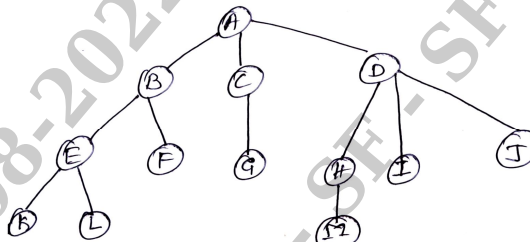   iii) Representation as a degree-two tree.
      For the following tree.

Fig.Q.7(a)

(10 Marks)

   b. Write a node structure for binary tree, write a function to perform the following:
      i)   Copying a binary tree.
      ii) Testing for equality of binary trees. **(10 Marks)**

OR

8 a. Define binary search tree. Design a function to perform the following:
      i)   Recursive search of a binary search tree
      ii) Iterative search of a binary search tree. **(10 Marks)**
   b. For the given data, draw a binary search tree and show the array and linked representation of the same. 100, 85, 45, 55, 110, 20, 70, 65. **(10 Marks)**

Module-5

9 a. Write 'C' function for the following tree traversals:
      i) Preorder   ii) Postorder   iii) Inorder with reference to the given binary tree, write the three traversals. **(10 Marks)**
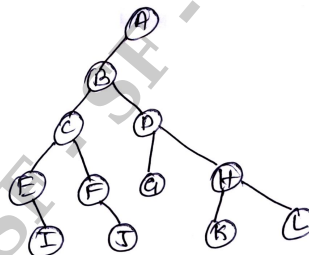

Fig.Q.9(a)

   b. Define graph, write the differences between graph and trees. Explain with example, different representation of graph. **(10 Marks)**

OR

10 a. Explain with example, different graph traversals methods. **(10 Marks)**
    b. Write a short note on Hashing. Explain any three popular Hash functions. **(10 Marks)**

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