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21CS32

Third Semester B.E. Degree Examination, June/July 2024
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. Write a program in C to demonstrate how whole structure is passed as a parameter to a function. **(04 Marks)**
    b. Define DMA. List and explain different DMA functions used in C. **(08 Marks)**
    c. Explain the representation of linear array in memory and give example. **(08 Marks)**

OR

2   a. Consider two polynomials $A(x) = 7X^{1000} + 4$ and $B(x) = x^4 + 5x^3 + 4x^2 + 3$. Show diagrammatically how these two polynomials can be stored in a single dimensional array. **(04 Marks)**
    b. Define polynomial and degree of the polynomial. Write the representation of polynomial using array and structures. **(08 Marks)**
    c. Write a program in C to read sparse matrix of integer values and to search the sparse matrix for an element specified by the user. **(08 Marks)**

Module-2

3   a. Define Stack. Give the C implementation of push and pop function. Include check for empty and full condition of stack. **(07 Marks)**
    b. Convert the following infix expression into prefix and postfix expressions:
    i) $((H * ((((A + ((B + C) * D)) * F) * G) * E)) + J)$
    ii) $A/B - C + D * E - A * C$ **(08 Marks)**
    c. Write a program in c to implement tower of Hanoi using recursive function. **(05 Marks)**

OR

4   a. Write a function in c to add, delete and display the elements from queue. **(07 Marks)**
    b. Write a program in c to implement the operations on a circular queue using dynamically allocated arrays. **(08 Marks)**
    c. What is priority queue? Briefly explain the types of priority queues. **(05 Marks)**

Module-3

5   a. Write a program in C to implement Stack operations using single linked list. **(07 Marks)**
    b. Write a program in C to implement Queue operations using single linked list. **(08 Marks)**
    c. Write a program in C to count the number of nodes in a single linked list. **(05 Marks)**

OR

6   a. Write a program in C to implement insert front, delete front and display functions using double linked list. **(07 Marks)**

b. Write a linked representation for the given sparse matrix.

$$A = \begin{bmatrix} 2 & 0 & 0 & 3 \\ 0 & 0 & 5 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & 8 \\ 0 & 7 & 4 & 0 \end{bmatrix}$$

Fig.Q.6(b)

(08 Marks)

c. Differentiate between single linked list and double linked list. **(05 Marks)**

Module-4

7 a. Define binary tree and state its properties. Show how binary tree is represented using an array and linked list. **(08 Marks)**

b. Write the binary tree for the expression A/B * C * D + E. Write the result of preorder and post order traversals for the given expression. **(07 Marks)**

c. Write the algorithm for preorder and post order traversals. **(05 Marks)**

OR

8 a. Define Threaded Binary Tree. Write the memory representation of Threaded Binary Tree for the given graph. **(08 Marks)**
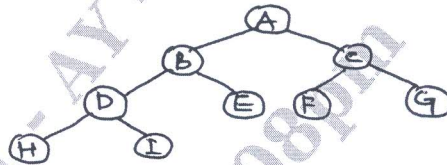

Fig.Q.8(a)

b. Draw the binary search tree for the following inputs and write recursive function to search for a given key value.

13 4 7 3 17 21 15 19 2 23

(07 Marks)

c. Write the applications of trees. **(05 Marks)**

Module-5

9 a. Define graph. What are the different methods of representing a graph? Give example.

(10 Marks)

b. Define the following with an example:
   i)   Directed graph
   ii) Multigraph
   iii) Complete graph
   iv) Cyclic and acyclic graph
   v)   Loop. **(10 Marks)**

OR

10 a. Define BFS with an example. Write a function in C to implement BFS. **(10 Marks)**

b. What is Hashing? Briefly explain the different types of hashing techniques. Construct the hash table for storing C built-in functions,
acos, define, float, exp, char, atan, ceil, floor
Note: Use hash table with 26 buckets and 2 slots per bucket. **(10 Marks)**

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