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**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)

- c. Differentiate between single linked list and double linked list.

(08 Marks)

(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)

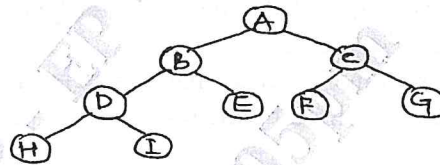


Fig.Q.8(a)

- 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  
 c. Write the applications of trees. (07 Marks)  
 (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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