CBCS SCHEME

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18CS32

Third Semester B.E. Degree Examination, June/July 2025
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. What is a structure? Compare and contrast between structure, union and array. Explain different types of structure declarations with examples. **(10 Marks)**

b. Describe usability of dynamic memory allocation functions using C program. **(06 Marks)**

c. How sequential mapping is classically performed on linear list? **(04 Marks)**

OR

2 a. Develop Knuth Morris Pratt pattern matching algorithm and apply the same to search the pattern 'a b c d f' in the text 'a b c d a b c a b c d f'. **(08 Marks)**

b. Write functions in C for the following operations without using built-in functions.
i) Compare two strings
ii) Concatenate two strings
iii) Reverse a string. **(06 Marks)**

c. Write the ADT of sparse matrix and give the triplet form of a given matrix and also find its transpose.

$$A = \begin{bmatrix} 7 & 0 & 0 & 0 & 0 \\ 0 & 0 & 9 & 0 & 0 \\ 3 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 0 & 5 \end{bmatrix}$$ **(06 Marks)**

Module-2

3 a. Write an algorithm to evaluate postfix expression and trace the same on given below expression.
i) 536 + * 635 - + *
ii) 532 + -293/= * 32 + **(08 Marks)**

b. What is recursion? Describe the concept of call stack in recursion by applying on Tower of Hanoi. How does it affect memory usage? **(12 Marks)**

OR

4 a. Write a program in C to implement push, pop, and display operations for Dequeues using array. **(10 Marks)**

b. Explain a mazing problem. **(10 Marks)**

Module-3

5 a. Write C functions to perform following on doubly linked list.
i) Inserting a node at the beginning
ii) Inserting a node at the given position
iii) Inserting a node at the end. **(10 Marks)**

b. Write a program in C to implement push, pop and display operations for circular queues using linked list. **(10 Marks)**

OR

6 a. Write a C program to implement insertion, deletion and display operations on a stack. **(10 Marks)**

b. Write the C function to add two polynomials, show the linked representation of the below two polynomials and their addition using a circular singly linked list $P_1 : 5x^3 + 4x^2 + 7x + 3$, $P_2 : 6x^2 + 5$. Output: add the above two polynomials and represent them using the linked list. **(10 Marks)**

Module-4

7 a. Demonstrate storage of binary trees using linked list. **(04 Marks)**

b. Define binary search tree. Construct a Binary Search Tree (BST) for the following elements: 100, 85, 45, 55, 120, 20, 70, 90, 115, 65, 130, 145. Traverse using in-order, pre-order and post-order traversal techniques, write recursive C functions for the same. **(08 Marks)**

c. Define the leftist tree and declaration in C. Check whether the given binary tree is a leftist tree or not for graph in Fig.Q.7(c) below. **(08 Marks)**

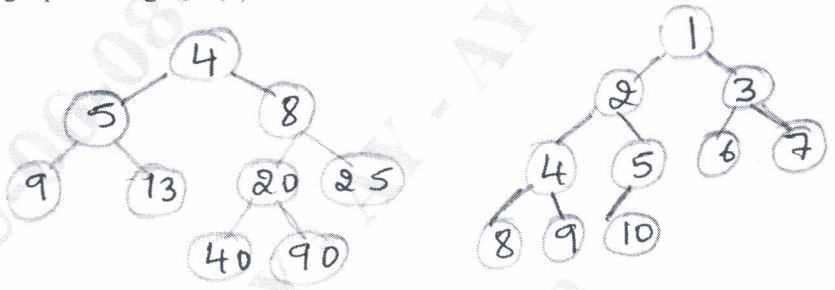

Fig.Q.7(c)

OR

8 a. What is a tree? With a suitable example define the following:

i) Binary tree
ii) Level of binary tree
iii) Complete binary tree
iv) Degree of the tree. **(10 Marks)**

b. What are the advantage and disadvantage of the threaded binary tree over binary tree? Explain the construction of threaded binary tree for A, B, C, D and E. **(10 Marks)**

Module-5

9 a. Describe traversal techniques involved in DFS, BFS with examples. **(10 Marks)**

b. Illustrate with an example sorting steps involved in insertion sort and address calculation sort. **(10 Marks)**

OR

10 a. What is chained hashing? Discuss its pros and cons. Construct the hash table to insert the keys: 7, 24, 18, 52, 36, 54, 11, 23 in a chained hash table of 9 memory locations. Use h(k) = k mod m. **(10 Marks)**

b. Summarize any 3 widely used file organization and indexing techniques. **(10 Marks)**

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