Third Semester B.E. Degree Examination, Feb./Mar. 2022

18CS32

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

- Define Data Structures. Explain the various operations on Data structures. 1 (06 Marks)
 - b. Define Structures. Explain the types of structures with examples for each. (07 Marks)
 - c. List and explain the functions supported in C for Dynamic Memory Allocation. (07 Marks)

a. Define Pattern Matching. Write the Knuth Morris Pratt Pattern matching algorithm and apply the same to search the pattern 'abcdabcy' in the text 'abcxabcdabxabcdabcy'.

b. Write the Fast Transpose algorithm to transpose the given Sparse Matrix. Express the given Sparse Matrix as triplets and find its transpose.

$$A = \begin{bmatrix} 10 & 0 & 0 & 25 & 0 \\ 0 & 23 & 0 & 0 & 45 \\ 0 & 0 & 0 & 0 & 32 \\ 42 & 0 & 0 & 31 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 30 & 0 & 0 \end{bmatrix}$$

(10 Marks)

Module-2

- Define Stacks. List and explain the various operations on stacks using arrays with stack overflow and stack underflow conditions.
 - b. Write an algorithm to convert an infix expression to postfix expression and also trace the same for the expression (a + b) * d + e/f + c. (10 Marks)

OR

- a. Define Recursion. Explain the types of recursion. Write the recursive function for
 - i) Factorial of a number ii) Tower of Hanoi. (10 Marks)
 - b. Give the Ackermann function and apply the same to evaluate A(1, 2). (04 Marks)
 - Explain the various operations on Circular queues using arrays. (06 Marks)

Module-3

- a. Give the node structure of create a single linked list of integers and write the functions to perform the following operations:
 - Create a list containing three nodes with data 10, 20, 30 using front insertion.
 - ii) Insert a node with data 40 at the end of list.
 - iii) Delete a node whose data is 30.

iv) Display the list contents.

(10 Marks)

Finding the length of the list Write the functions for : i) ii) Concatenate two lists Reverse a list. (10 Marks)

1 of 2

Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice. Important Note: 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be

18CS32

OR

- 6 a. Write the node representation for the linked representation of a polynomial. Explain the algorithm to add two polynomials represented as linked list. (08 Marks)
 - b. For the given Sparse matrix, write the diagrammatic linked list representation

A 0 0 0 0 A 0 0 0 0 4 0 0 8 0 0 9 0

(04 Marks)

- c. List out the differences between single linked list and double linked list. Write the functions to perform following operations on double linked list:
 - i) Insert a node at rear end of the list
- ii) Delete a note at rear end of the list
- iii) Search a node with a given key value.

(08 Marks)

Module-4

- 7 a. Define a Tree. With suitable example explain i) Binary tree ii) Complete binary tree iii) Strict binary tree iv) Skewed binary tree. (10 Marks)
 - b. Write the routines to traverse the given tree using
 - i) Pre Order traversal
- ii) Post Order traversal

(06 Marks)

c. Write the recursive search algorithm for a Binary Search tree.

(04 Marks)

OR

- 8 a. Draw a Binary tree for the following expression: ((6+(3-2)*5)^2+3.

 Traverse the above generated tree using Pre order and Post order and also write their respective functions.

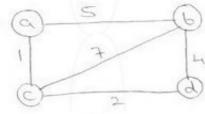
 (10 Marks)
 - b. Write the routines for:
 - i) Copying of binary trees ii) Testing equality of binary trees.

(10 Marks)

Module-5

9 a. Define Graphs. Give the Adjacency matrix and Adjacency list representation for the following graph in Fig. Q9(a). (08 Marks)

Fig. Q9(a)



- b. Write the algorithm for following Graph Traversal methods:
 - i) Breadth first search
- Depth first search.

(08 Marks)

c. Write an algorithm for insertion sort.

(04 Marks)

OR

10 a. Define Hashing. Explain any three Hash functions.

(08 Marks)

b. Explain Static and Dynamic hashing in detail.

(08 Marks)

c. Define the term File Organization. Explain indexed sequential File Organization. (04 Marks)

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2 of 2