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Third Semester B.E. Degree Examination, Jan./Feb. 2023 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. Explain dynamic memory allocation functions with examples. (08 Marks)
b. With an example, illustrate Knuth Marris Pratt pattern matching algorithm. (08 Marks)
c. Consider two polynomials:
 $A(x) = 4x^{15} + 3x^4 + 5$
 $B(x) = x^4 + 10x^2 + 1$
Show diagrammatically how these polynomials can be stored in a 1-D array. Also give its C representation. (04 Marks)

OR

- 2 a. With a suitable example, show sparse matrix representation using array of triplets and its transpose. Write a C function to transpose a sparse matrix. (08 Marks)
b. Write the C function for the following :
(i) Inserting an item at a specified position in an array
(ii) Deleting an item from a specified position
(iii) Searching an item in array using linear search
(iv) Reversing a string (12 Marks)

Module-2

- 3 a. Define stack. Write the C function for push, pop and display operation. (07 Marks)
b. Convert the following infix expression into postfix expression using tabular approach.
(i) $(a + b) * d + e / (f + a * d)$
(ii) $((a - (b + c)) * d) \$ (e + f)$ (08 Marks)
c. Write the recursive function for tower of hanoi. Illustrate with an example. (05 Marks)

OR

- 4 a. What is input restricted double ended queue? Implement the supporting functions of input restricted double ended queue. (08 Marks)
b. Write the algorithm and C function to evaluate the postfix expression. Illustrate the same with an example. (08 Marks)
c. Write a C program to find the GCD of two given number using recursion. (04 Marks)

Module-3

- 5 a. Write the C functions for the following:
(i) To search an item in the list
(ii) To find the number of nodes in a list
(iii) To reverse a singly linked list (08 Marks)
b. What are the advantages of doubly linked list? With examples, illustrate the same. (04 Marks)
c. Write the node structure to represent polynomial. Give C function to add two polynomials. (08 Marks)

OR

- 6 a. Write the node structure of sparse matrix representation. Draw the diagrammatic representation of linked list for the following matrix.

$$A = \begin{bmatrix} 0 & 0 & 4 & 0 & 1 \\ 6 & 5 & 0 & 0 & 0 \\ 0 & 3 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 2 \end{bmatrix}$$

(08 Marks)

- b. Write the C function of doubly linked list for the following:
- To insert at front of the list
 - To insert at end of the list
- c. Write the C function of circular singly linked list for the following:
- To delete a node from front of the list
 - To delete a node from end of the list

(06 Marks)

(06 Marks)

Module-4

- 7 a. Explain the following with example:
- Binary Tree
 - Height of a binary tree
 - Complete binary tree
 - Skewed binary tree
- b. Write the C function for inorder and postorder traversal.
- c. Given Inorder : DJGBHEAFKIC and Postorder: JGDHEBKIFCA. Construct a binary tree.

(08 Marks)

(06 Marks)

(06 Marks)

OR

- 8 a. With example, illustrate threaded binary tree.
- b. Construct a binary search tree for the following 100, 85, 45, 55, 110, 20, 70, 65. Also write a C function to search for a given value in a binary search tree.

(10 Marks)

(10 Marks)

Module-5

- 9 a. Define graph. With an example, illustrate the adjacency matrix and adjacency. List representation.
- b. What are the methods used for traversing a graph? Explain any one with example.
- c. With an example, illustrate the working of insertion sort.

(08 Marks)

(07 Marks)

(05 Marks)

OR

- 10 a. What is collision? What are the methods to resolve collision? Write the C function of linear probing and explain with an example.
- b. What is indexing? List the various methods of indexing. Explain any two methods with example.

(10 Marks)

(10 Marks)
