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Third Semester B.E. Degree Examination, Dec.2016/Jan.2017 Data Structures and Applications

Time: 3 hrs.

Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. What is an algorithm? Explain the criteria that an algorithm must satisfy. (08 Marks)
- b. Write a function to sort integers using selection sort algorithm. (04 Marks)
- c. Consider two polynomials,
 $A(x) = 4x^{15} + 3x^4 + 5$ and $B(x) = x^4 + 10x^2 + 1$
 Show diagrammatically how these two polynomials can be stored in a 1-D array. Also give its C representation. (04 Marks)

OR

- 2 a. Write the Knuth Morris Pratt pattern matching algorithm and apply the same to search the pattern 'abcdabcy' in the text 'abcxabcdabxabcdabcy'. (08 Marks)
- b. Write the fast transpose algorithm to transpose the given sparse matrix. Express the given sparse matrix as triplets and find its transpose.

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

(08 Marks)

Module-2

- 3 a. Write the algorithm to implement a stack using dynamic array whose initial capacity is 1 and array doubling is used to increase the stack's capacity (that is dynamically reallocate twice the memory) whenever an element is added to a full stack. Implement the operations-push, pop and display. (08 Marks)
- b. Write the algorithm for of tower of Hanoi. (04 Marks)
- c. Write a note on Ackerman's function. (04 Marks)

OR

- 4 a. List the disadvantages of linear queue and explain how is it solved in circular queue. Give the algorithm to implement a circular queue with suitable example. (08 Marks)
- b. Convert the infix expression, $((a/(b-c+d))*(e-a)*c)$ to postfix expression. Write a function to evaluate that postfix expression and trace for the given data $a = 6, b = 3, c = 1, d = 2, e = 4$. (08 Marks)

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 treated as malpractice.

Module-3

- 5 a. Give the node structure to create a singly linked list of integers and write functions to perform the following :
- Create a list.
 - Assume the list contains 3 nodes with data 10, 20, 30. Insert a node with data 40 at the end of the list.
 - Insert a node with data 50 between the nodes having data values 10 and 20.
 - Display the singly linked list. (08 Marks)
- b. What is the advantage of doubly linked list over singly linked list? Illustrate with an example. (04 Marks)
- c. For the given sparse matrix, write the diagrammatic linked list representation.

$$A = \begin{bmatrix} 0 & 10 & 0 & 0 \\ 3 & 0 & 0 & 5 \\ 8 & 0 & 2 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 8 & 0 \end{bmatrix}.$$

(04 Marks)

OR

- 6 a. Write the functions for singly linked list with integer data to search an element in the list. (08 Marks)
- b. Write the node structure for linked representation of polynomial. Explain the algorithm to add two polynomials represented using linked lists. (08 Marks)

Module-4

- 7 a. What is a tree? With suitable example define (i) Binary tree (ii) Level of a binary tree (iii) Complete binary tree. (08 Marks)
- b. Write the routines to traverse the given tree using (i) Pre-order traversal and (ii) Post order traversal. (08 Marks)

OR

- 8 a. What is a binary search tree? Write algorithm to implement for recursive search or iterative search for a binary search tree. (08 Marks)
- b. Write the routines for, (i) Create a binary tree. (ii) Testing for equality of binary trees. (08 Marks)

Module-5

- 9 a. What is a graph? Give the matrix and adjacency list representation of graphs. (08 Marks)
- b. Write an algorithm for bubble sort. Trace the algorithm for the data : 30, 20, 10, 40, 80, 60, 70. (08 Marks)

OR

- 10 a. Explain open addressing and chaining used to handle overflows in hashing. (05 Marks)
- b. Explain directoryless dynamic hashing. (05 Marks)
- c. Briefly explain basic operations that can be performed on a file. Explain indexed sequential file organization. (06 Marks)
