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15CS33

Third Semester B.E. Degree Examination, June/July 2018
Data Structures and Applications

Time: 3 hrs.   Max. Marks: 80

**Note: Answer any FIVE full questions, choosing
ONE full question from each module.**

Module-1

1 a. Differentiate between structures and unions. **(04 Marks)**
   b. Explain with example :   i) insertion and   ii) deletion in an array. **(08 Marks)**
   c. Suppose each student in a class of 25 students is given 4 tests, assume the students are numbered from 1 to 25, and the test scores are assigned in the 25×4 matrix called SCORE. Suppose Base (SCORE) = 200, w = 4 and the programming language uses row–major order to store this 2D array, then find the address of 3rd test of 12th student i.e SCORE (12, 3). **(04 Marks)**

OR

2 a. List and explain any 4 functions supported in C for dynamic memory allocation with examples. **(08 Marks)**
   b. Consider 2 polynomials $A(x) = 2x^{1000} + 1$ and $B(x) = x^4 + 10x^3 + 3x^2 + 1$ with a diagram show how these polynomials are stored in 1D array. **(02 Marks)**
   c. With an example illustrate that "product of 2 sparse matrices may not be sparse". Also write a C function for matrix multiplication of 2 sparse matrices. **(06 Marks)**

Module-2

3 a. Write an algorithm to evaluate a postfix expression. Evaluate the following postfix expression abc + * d e/- where a = 5, b = 6, c = 2, d = 12, e = 4. **(06 Marks)**
   b. Write the algorithm for Ackermann function. Evaluate A(1, 2) using ACKERMANN function. **(04 Marks)**
   c. With a neat diagram explain ONE–WAY list representation of a priority queue. **(06 Marks)**

OR

4 a. Write a C program demonstrating the various stack operations, including cases for overflow and underflow of STACKS. **(08 Marks)**
   b. Describe how you could model a maze, where 0 represents open paths and 1 represents barriers. What moves are permitted in the matrix model? Provide an example MAZE together with its allowable moves and table of moves. **(08 Marks)**

Module-3

5 a. Write a function for singly linked lists with integer data, to search an element in the list that is unsorted and a list that is sorted. **(08 Marks)**
   b. Given 2 singly linked lists. LIST-1 and LIST-2. Write an algorithm to form a new list LIST-3 using concatenation of the lists LIST-1 and LIST-2. **(08 Marks)**

OR

6 a. Write a note on header linked list. Explain the widely used header lists with diagrams.

(05 Marks)

b. List out any 2 differences between doubly linked lists and singly linked list. **(02 Marks)**

c. Illustrate with examples how to insert a node at the beginning, INSERT a node at intermediate position, DELETE a node with a given value. **(09 Marks)**

Module-4

7 a. Write a short note on threaded binary trees and state the rules to construct a threaded binary tree. **(08 Marks)**

b. With separate functions illustrate recursive search and iterative search of a binary search tree. **(08 Marks)**

OR

8 a. Consider the following tree T in (Fig.8(a)) write the preorder, inorder, postorder for the tree T. Also find the depth of TREE in (Fig.Q8(a)). **(04 Marks)**
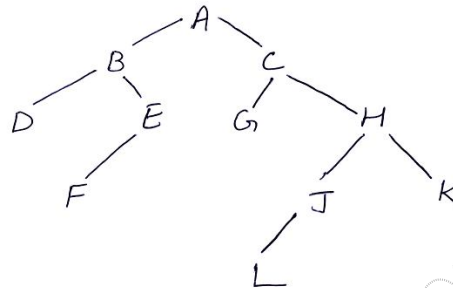

Fig.Q8(a)

b. Write functions to illustrate "copying of binary trees", and "testing equality of binary trees".

(08 Marks)

c. Define complete binary tree. Illustrate with examples. **(04 Marks)**

Module-5

9 a. State and explain WARSHALLS algorithm with an example. **(08 Marks)**

b. Write an algorithm for insertion sort. Apply insertion sort, showing the various passes to sort the array A, where A = [77, 33, 44, 11, 88, 22, 66, 55]. **(08 Marks)**

OR

10 a. Write a short note on hashing. Explain any 3 popular HASH functions. **(08 Marks)**

b. What do you understand by the term file organization? Briefly summarize any 3 widely used file organization techniques. **(08 Marks)**

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