CBCS Scheme

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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)
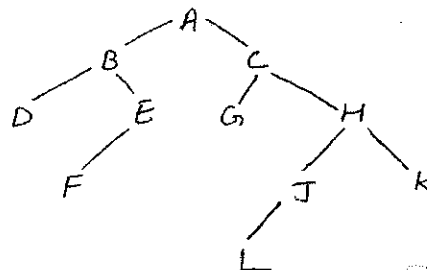

Fig.Q8(a)

   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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