

CSE/T/213A/2016

BACHELOR OF COMPUTER SC. & ENGINEERING EXAMINATION, 2016
(2nd Year, 1st Semester)
DATA STRUCTURES AND ALGORITHMS
Time : Three hours

Full Marks : 100

Answer question no. 1 and any *four* from the rest.

1. (a) What are the required qualities of a good hash function? 2
- (b) Show how the following polynomial can be represented using a linked list: ✓
 $6.7x^{90} - 10.5x^{77} + 13x^{25} + x^3 - 25.3$ 2
- (c) What do you mean by a sentinel? Explain when you use sentinels. 3
- (d) Explain how you can detect errors in a post-fix expression during evaluation. 4
- (e) Draw the Binary Search Tree formed by the insertion of the following characters in the order they are given:
K L F T D Y M E A Z 3
- (f) What do you mean by a Stable Sorting Algorithm? Explain with an example. 4
- (g) Show how the following array will be sorted in increasing order using Insertion Sort algorithm:
~~80~~ ~~90~~ ~~70~~ ~~100~~ ~~10~~ ~~20~~ ~~40~~ ~~60~~ ~~50~~. 2
- ✓ 2. Explain the rationale of Quicksort. Why does the algorithm perform so fast? What are the cases when the Quicksort algorithm behaves like a slow sort? What is the effect of the choice of pivots on the performance of Quicksort algorithm?
- Describe the algorithm of Quicksort and explain its working with the help of the following input array:
~~25~~, ~~14~~, ~~57~~, ~~16~~, ~~69~~, ~~17~~, ~~70~~, ~~18~~, ~~88~~, ~~99~~. 5+2+2+3+8=20
- ✓ 3. Write a C program to accept two integers from the user and to find and print the Greatest Common Divisor of the two numbers. Your program should take care of all possible bad inputs from the user.
Write the approach you have taken to develop the above algorithm and find out the time complexity of your program. 20

add /

- ✓ 4. What do you mean by Binary Recursion? Explain in detail with two examples.

Explain how recursive calls are implemented using stack. Write a recursive function for finding out the nth Fibonacci number and show how the runtime stack changes for computing the 3rd Fibonacci number using your function.

$$2+6+4+8 = 20$$

- ✗ 5. Give the ADT for Threaded Binary Tree. Define the data type for nodes of Threaded Binary tree in C language. Develop the C functions for inserting a leaf to and deleting a leaf from a threaded binary tree node

Write a function to inorder-traverse a threaded binary tree. What are the benefits you get in your function compared to a recursive inorder-traverse algorithm for a straight-forward binary tree? Explain.

$$3+2+6+6+3 = 20$$

- ✗ 6. A rat has entered in a checkerboard maze through one corner, where the white boxes are open and black boxes represent obstacles. Develop an algorithm by which the rat can exit the maze through the opposite corner (these two corner boxes are open). Clearly explain the representation of the maze and any specific data structure you have used for the algorithm.

20

- 7. Explain Dijkstra's Shortest Path Algorithm. Show its working using a suitable graph.

✗ What do you mean by Hashing? What is the complexity of insertion, deletion and search in a hash table. Explain how you can delete an element from a hash table. Explain how coalesced chaining works.

$$10 + 10$$

- ✓ 5. Write the following functions in C with proper comments:
- To test whether two stacks are equal or not, stacks remaining unchanged after the test. (Define what you mean by equality of two stacks).
 - To compute the hash value of a large integer using the folding hash function.
 - To rotate right a binary tree.
 - To search a Graph using the Breadth First Search Algorithm.

$$6+6+3+5=20$$

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