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B.TECH
(SEMESTER IV) THEORY EXAMINATION 2017-18
DATA STRUCTURE & ALGORITHMS

Time: 3 Hours**Total Marks: 70**

- Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.
2. Any special paper specific instruction.

SECTION A

1. **Attempt all questions in brief.** **2 x 7 = 14**

- a. What do you mean by Abstract Data Type of a data structure?
- b. Differentiate internal sorting and external sorting also enlists the name of two sorting techniques of each.
- c. Write a C program to multiply two integer number using recursion
- d. What do you mean by priority queue?
- e. Define Threaded binary tree with advantage over binary tree.
- f. Explain Transitive Closure.
- g. Write the function to insert an element is circular queue.

SECTION B

2. **Attempt any three of the following:** **7 x 3 = 21**

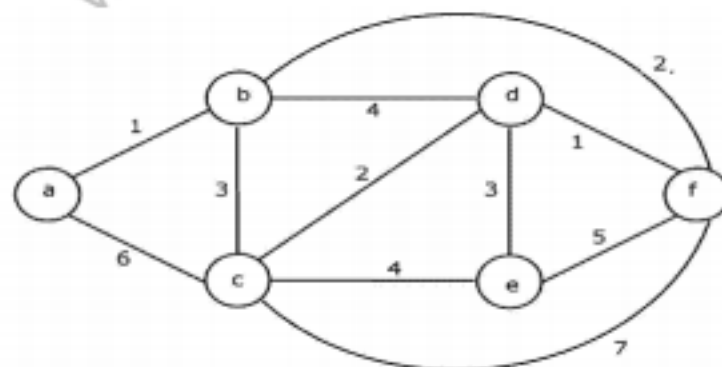
- a. Consider the two dimensional lower triangular matrix(LTM) of order N ,Obtain the formula for address calculation in the address of row major and column major order for location LTM[j][k],if base address is BA and space occupied by each element is w byte.
- b. In the Towers of Hanoi puzzle, we are given a platform with three tower, a,b, and c, sticking out of it. On tower a is a stack of n disks, each larger than the next, so that the smallest is on the top and the largest is on the bottom .The puzzle is to move all the disks from tower a to tower c, moving one disk at a time,so that we never place a larger disk on top of a smaller one.
 - (i) Describe a recursive algorithm for solving the Towers of Hanoi puzzle for arbitrary n disk
 - (ii) How many function calls are there for n disks?.
- c. Define stack with suitable example. Write a program to reverse a string using Stack. Choose a C data structure for such a stack and design push and pop functions for it.
- d. Translate the infix string $(a+b^c^d)*(e+f/d)$ to reverse polish notation using stack.
- e. Explain any three commonly used hash function with the suitable example?
A hash function H defined as $H(\text{key}) = \text{key} \% 7$, with linear probing ,is used to insert the key 37,38,72,48,98,11,56 into a table indexed from 0 to 6.



what will be the location of key 11. Justify your answer, also count the total number of collision in this probing.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7
- What are the advantages of linked list over arrays? Implement Doubly Circular linked list and insert an element at given position in this linked list.
 - Assume that the operators $+$, $-$, \times are left associative and $^$ is right associative. The order of precedence (from highest to lowest) is $^$, \times , $+$, $-$. Then find the postfix expression corresponding to the infix Expression $a + b \times c - d \wedge e \wedge f$
4. Attempt any *one* part of the following: 7 x 1 = 7
- Draw the Huffman tree for the following symbols (each of 7 bits) whose frequency Of occurrence of a message is stated along with the symbols below:
 M1: 0.45 M2: 0.02 M3: 0.24 M4: 0.18 M5: 0.11
 decode the following message
 10110011011111001100101111101101100.
 and what is the average number of bits required per message.
 - Write algorithm for Floyd warshall algorithm also explains with a suitable example.
5. Attempt any *one* part of the following: 7 x 1 = 7
- Write C function for following in Binary Tree
 - Count the number of total nodes.
 - Height of Binary Tree.
 - Write Prim's algorithms and Find the Minimum Spanning tree for following graph



6. Attempt any *one* part of the following:

7 x 1 = 7

- a. Construct a binary tree for the following preorder and inorder traversals. Explain with a neat diagram:

Preorder: ABDIEHJCFKLGM

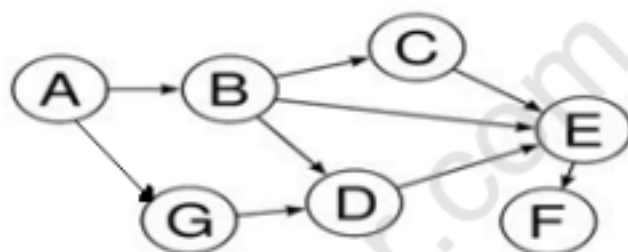
Inorder: DIBHJEAFLKCGM

- b. Explain Binary Search algorithm and its time complexity? Implement the binary search in C language.

7. Attempt any *one* part of the following:

7 x 1 = 7

- a. Discuss what type of data structure is used in DFS. Write an algorithm for DFS. Traverse the given graph starting from node A using DFS.



- b. Construct an expression tree for the expression $(-b + \sqrt{b^2 - 4ac}) / 2a$. Give pre-order, in-order and post-order traversals of the expression tree so formed.