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B.TECH
(SEM III) THEORY EXAMINATION 2022-23
BASIC DATA STRUCTURE & ALGORITHMS

Time: 3 Hours | *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2x10=20

(a) Define algorithm and its characteristics.

(b) List the various asymptotic notations? Explain Big Oh notations along with suitable diagram.

(c) In the reference of Tower of Hanoi problem if there are7 disks. Solve the number of years will it need to move from one tower to another, assume that one move takes 1 second.

(d) Explain circular queue. What is the condition if circular queue is full?

(e) Differentiate strict and Complete Binary Tree.

(f) Define Binary heaps.

(g) Explain Transitive closure of a Graph.

(h) List the different types of representation of graphs

(i) Differentiate Internal and External Sorting.

(j) State the number of swaps perform by bubble sort to sort the following array of integer9,2,3,5,4,1,10,8,7.

SECTION B

2. Attempt any *three* of the following: 10x3=30

(a) Consider a multi-dimensional Array in C language ARR [20] [30] [40] and address of ARR [2][3][4] is 1000. Calculate the address of ARR [6] [7] [8] in row major order and column major order. Assume the first element is stored at ARR [1][2][3] and each element take 2 bytes.

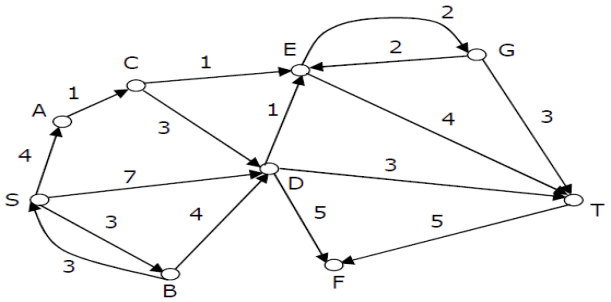
(b) Write a C program to delete a node from K^{th} position in singly linked list.

(c) Construct an expression tree for the following algebraic expression.

(3a-b) ↑2(4c+2d) ↑3

Note: ↑ is exponent operator.

(d) Find the single source shortest path for following graph using Dijkstra algorithm.



(e) Compare B tree and B+ tree with suitable example.

SECTION C

3. Attempt any *one* part of the following: 10x1=10

(a) Consider a 2-dimension array LTM [10…100] [10…80] in lower triangular matrix (LTM) representation. The size of each element in array is 2 bytes. If the array is implemented in the memory in the form of row major order and base address of array is 1000, then write the address of LTM [30][40].

(b) Write a complete C program to add to polynomial using singly linked list.

4. Attempt any *one* part of the following: 10x1=10

(a) Implement C language to print Fibonacci series using recursive and non-recursive function.

(b) Write an algorithm to evaluate postfix expression also find the value of 7,5,2,-,*,4,1,5,-,/,+.

5. Attempt any *one* part of the following: 10x1=10

(a) For a binary tree T, the preorder and in-order traversal sequences are as follows :
In order: B C A E G D H F I J
Preorder: A B C D E G F H I J
(i) Construct a binary Tree.
(ii) What is its post-order traversal sequence?

(b) A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the piece of message (each character occupies 7 bits) written in *italic* letter.
when you are on the left you are on the right. when you are on the right, you are on the wrong.
Suggest the answer to following question based on above problem.
(i) Construct Huffman tree.
(ii) Decode the message following message 10111101010111111111100.
(iii) Calculate the percentage of space saved in the message after compression?

6. Attempt any *one* part of the following: 10x1=10

(a) Write sort notes on following.
(i) Topological Sort
(ii) Activity Network

(b) Differentiate between Breadth First Search (BFS) and Depth First Search (DFS) with suitable example.

7. Attempt any *one* part of the following: 10x1=10

(a) Write an algorithm for Merge Sort. Explains with the help of suitable example.

(b) Construct a B-Tree of order 5 with the following sequence of integer.
10,90,20,80,30,70,40,60,50,35,55,15,25,5,75,85,95,45,100,22,12.