

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 110307

Roll No.

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B. Tech. (Semester-III)

SPL. THEORY EXAMINATION, 2014-15

DATA STRUCTURE USING C

Time : 3 Hours]

[Total Marks : 100

Note: Attempt all questions.

1. Attempt any four of the following : 4×5=20

(a) Explain asymptotic notations. Define Big-Oh Notation and find the complexity of following recursive function

$$T(n)=4T(n/2)+n\log n$$

(b) An array Mat[1...7] [1...20] is stored in memory with each element requiring 2 bytes of storage. If base address of array is 1000 then calculate the location of Mat[4] [6] when the matrix stored in row major order.

(c) Given two Linked Lists, create a C function for union and intersection lists that contain union and intersection of the elements present in the given lists.

Order of element in output lists doesn't matter.

Example:

Input:

List1: 10->15->4->25

List2: 8->4->2->10

Output:

Intersection List: 4->10

Union List: 2->8->25->4->15->10

- (d) Explain the memory representation of lower triangular matrix (2D) of N dimension. Determine the address formula of any element $LTM[i,j]$ where $1 \leq i \leq N$ and $1 \leq j \leq N$ in the lower triangular matrix, if the elements are stored in row major order.
- (e) What do you mean by Sparse Matrices? Discuss the memory representation of sparse matrices. Also write a C function to represent a Sparse Matrices.
- (f) Discuss the polynomial Representation of linked list. Write a C function to add two Polynomials using linked list.

2. Attempt any four of the following : 4×5=20

(a) Justify your answer of the following :

In reference of a Tower of Hanoi problem for n disks suggest your answer of the following :

i) How many function called?

5. Attempt any two of the following : $2 \times 10 = 20$

- (a) Construct a B-tree on following sequence of inputs 5, 29, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100. Assume that the order of B-tree is 3.

Explain the difference between B-Tree and B+ tree with the help of example.

- (b) Write a C function for Merge sort.

Consider the below given values of the elements as priorities to build the min heap tree and sort then heap sort : 3, 6, 32, 56, 25, 57, 48, 37, 12, 92, 86, 33, 100, 1, 8.

- (c) What do you mean by Hashing? Explain any four hash functions and also point the element where collision occurs in all above four hash function.

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 48 in hash table? Justify your answer.

—x—

- ii) How many moves will occur?
iii) After how many function call first move take place

- (b) Convert the infix expression $a + b * c - d/e$ into prefix expression using Stack and also write the maximum stack size required to convert this expression.

- (c) Write algorithms to insert and delete an element in a circular queue.

- (d) Write an algorithm for Evaluation of Prefix Expression.

- (e) Write a C function to insert and delete an element in/ from a Queue.

- (f) Define basic properties of a recursive function, when a function said to be Tail Recursion. Explain with the help of an example.

3. Attempt any two of the following : $2 \times 10 = 20$

- (a) For a binary tree T, the pre-order and in-order traversal sequences are as follows :

Pre-order : G B Q A C K F P D E R H

In-order : Q B K C F A G P E D H R

- i) What is the height of the tree?

- ii) What are the internal nodes?

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(6)

1,625

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(3)

[Contd...

iii) What is its post-order traversal sequence?

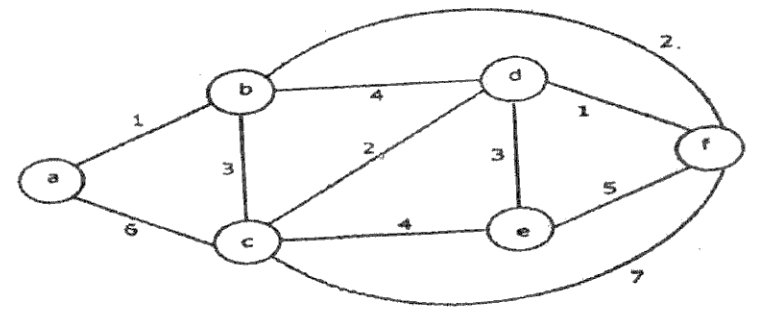
(b) Draw the Huffman tree for the following symbols whose frequency of occurrence of a message is stated along with the symbols below :

M1: 0.45 M2: 0.02 M3: 0.24 M4: 0.18 M5: 0.11
and decode the following message
10110011011111001100101111101101100

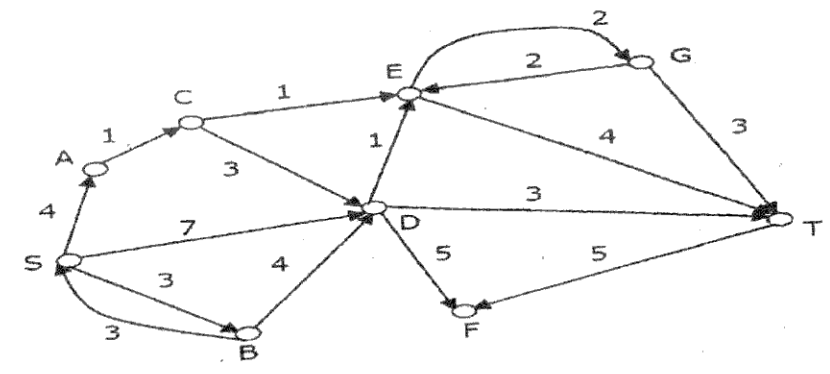
(c) Draw an AVL tree on following inputs assume that the tree is initially empty.
5, 7, 3, 99, 45, 55, 65, 75, 80, 90, 100, 110, 120, 130, 40, 35, 25, 20, 15, 10, 5, 101

4. Attempt any two of the following : 2×10=20

(a) Write algorithm for Kruskal algorithms and find the minimum spanning tree for following graph (Use Prim's Algorithm)



(b) Write an algorithm for Floyd Warshall algorithm and find the single source shortest path for following graph using dijkstra algorithms.



(c) Write DFS algorithm and find the DFS for following adjacency matrix of a graph:

	0	1	2	3	4	5	6	7	8
0	0	1	0	0	1	0	0	0	0
1	1	0	1	1	0	0	0	0	0
2	0	1	0	0	0	0	1	0	0
3	0	1	0	0	1	1	0	0	0
4	1	0	0	1	0	0	0	0	0
5	0	0	0	1	0	0	0	0	1
6	0	0	1	0	0	0	0	0	1
7	0	0	0	0	0	0	1	0	1
8	0	0	0	0	0	1	1	0	0