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Paper Code:MCA-213	Roll No.									

MCA
(SEM II) EVEN SEMESTER EXAMINATION, 2015-16
DATA STRUCTURE USING 'C'

[Time: 3 hrs.] **[Max. Marks: 100]**

Note- Attempt All Questions. All Questions carry equal marks.

Q.1 Attempt any four parts of the following:- **[5x4=20]**

(a) Define the term algorithm. How we measure the complexity of an algorithm? Give various notations.
(b) Write a C program for 2D representation to sparse representation (list of 3 triples)
(c) Each element of array Data [15][25] requires 4 bytes of storage. Base address of Data is 23 50. Determine the location of Data[5][8] when the array is stored as
i) Row Major ii) Column Major
(d) Write an algorithm for evaluation of postfix expression using a stack. Write postfix and prefix expression for **(A + (B - C))*((D – E)/(F- G+H))**
(e) What do you understand by Stack? Give the algorithm of insertion and deletion of stack using array.
(f) Explain Tower of Hanoi Problem using recursion for 3 disks.

Q.2 Attempt any two parts of the following:- **[10x2=20]**

(a) i) Write an algorithm to search a ITEM in a given singly linked list.
ii) Write an algorithm for removing duplicate element from a linked list.
(b) Discuss doubly linked list. Write an algorithm to insert a value X at the beginning of doubly linked list.
(c) Define Dequeue. Give its operations. Write an algorithm to implement a dequeue using circular array.

Q3 Attempt any two parts of the following:- **[10x2=20]**

(a) i) Inorder and Preorder traversal of a tree T is given as follows:
Inorder: **B E D F A G C H**
Preorder: **A B D E F C G H**
Draw the Tree T. Write recursive algorithm for preorder tree traversal.
ii) What is collision in Hashing? Discuss various collision resolution strategies.

(b) i) Explain how Binary Search method fails to find **43** in the given sorted array:
8, 12, 25, 26, 35, 48, 57, 78, 86, 93, 97, 108, 135, 168, 201
ii) Create the Huffman tree with the following nodes and find Huffman code

A	B	C	D	E	F	G	H	I	J
16	7	8	13	26	5	7	2	16	42

(c) What are threaded binary tree? i) Write algorithm for in order traversal of threaded binary tree
ii) Show that maximum number of nodes in a binary tree of height h is $2^{h+1} - 1$

Q4 Attempt any two parts of the following:- **[10x2=20]**

(a) Apply insertion sort algorithm to sort the list ***E, X, A, M, P, L, E*** in alphabetical order.

(b) i) Define the properties of Heap. Construct a heap for the list **1, 8, 6, 5, 3, 7, 4** by algorithm
ii) Define AVL tree. Construct an AVL tree for the list **3, 6, 5, 1, 2, 4.**

(c) i) Create a Binary Search Tree from the following data elements : **10, 5, 15, 1, 8, 7, 20, 2**
ii) Define B-Tree. Create a B-Tree of order 3 for the following data
78, 21, 14, 11, 97, 85, 74, 63, 45, 42, 57, 20, 16, 19, 32, 30, 31

Q5 Attempt any two parts of the following:- **[10x2=20]**

(a) i) Define Graph. For an undirected graph G having 'n' vertices and 'e' edges show that (for i=1 to n) $\sum$ **d_i =2e** : where d_i = degree of vertex 'i'
ii) Differentiate between spanning tree and minimum spanning tree? Consider the following graph in **Fig 1**, find minimum cost spanning tree using Prim's Algorithm.

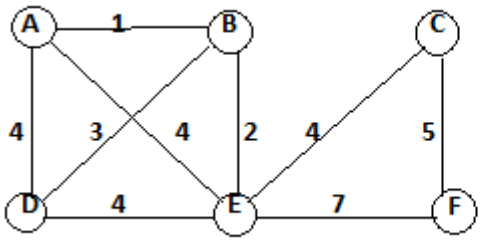

Fig 1

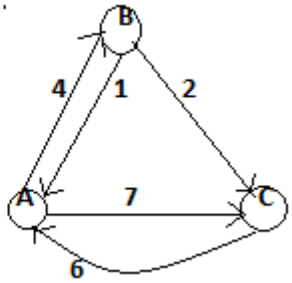

Fig 2

(b) Consider the graph given in **Fig 2**, Apply Floydd Warshell shortest path algorithm on it and find shortest path.

(c) Define file structure. Define various types of files. Explain indexed sequential file with example.