Total No. of Questions—12] [Total No. of Printed Pages—4+1

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S.E. (Computer) (II Sem.) EXAMINATION, 2010

DATA STRUCTURES

(2008 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Your answers will be valued as a whole.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Write an algorithm for post-order recursive traversal of a binary tree, also write a 'C++' function for the same. [6]

(*b*) Explain the concept of :

(*i*) Full Binary Tree

(*ii*) Skewed Binary Tree. [4]

(*c*) (*i*) What is the use of a Threaded binary tree ?

(*ii*) Write an algorithm for the in-order Traversal of a Threaded Binary tree.

(*iii*) State any *two* applications of trees. [8]

P.T.O.

Or

2. (*a*) (*i*) Write a 'C++' recursive function for counting of nodes in a tree.

(*ii*) Write a 'C++' recursive function for finding height of a tree. [6]

(*b*) Explain the concept of representation of a binary tree using an array. [4]

(*c*) Explain the difference between a tree and a binary search tree.

Write an algorithm for conversion of binary tree to binary search tree. [8]

3. (*a*) Define the following :

(*i*) A complete graph

(*ii*) A weighted graph. [4]

(*b*) Considering the complete graph with n-vertices, show that the number of spanning trees are at least $2^{n-1} - 1$. [6]

(*c*) What is a minimal spanning tree ? How is it different from the shortest path sequence of a given graph ? Justify your answer with an example. [6]

Or

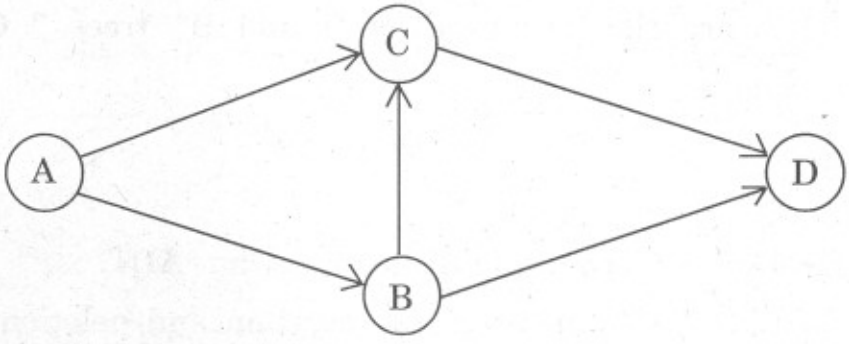
4. (*a*) Explain the following with example :

(*i*) Adjacency list of a graph

(*ii*) Strongly connected components. [4]

(*b*) Write a pseudo 'C' code to find minimum spanning tree using Kruskal's algorithm. [6]

(*c*) Write all the algorithmic steps of topological sorting. Consider the following graph and apply topological sorting : [6]



Graph

5. (*a*) What is a Hashing function ? Explain any **4** types of Hashing functions. [6]

(*b*) Create an AVL tree for the following data :

30, 31, 32, 23, 22, 28, 24, 29, 26, 27, 34, 36. [6]

(*c*) What is an optimal binary search tree ? What is its use ? [4]

Or

6. (*a*) Give any **3** points of comparison between Binary search tree, OBST, Huffman's tree and AVL tree. [6]

(*b*) Obtain the height balance tree for the following sequence of data :

December, January, April, March, July, August, October, November, May, June. Show all steps. [6]

(*c*) Write a non-recursive function for insertion of an element in AVL tree. [4]

SECTION II

7. (*a*) Explain the concept of Max heap and Min heap. [4]

(*b*) What is a B- tree ? Write an algorithm to delete a node from B- tree. [8]

(*c*) What is a B^+ tree ? Give the structure of its internal node. What are the variations of B and B^+ trees ? Give any *two* variations. [6]

Or

8. (*a*) Explain the concept of heap as an ADT. [4]

(*b*) Write a 'C++' functions for insertion and deletion in a priority queue, represented using a heap. [8]

(*c*) Explain B- trees and B+ trees for indexing of the data. [6]

9. (*a*) Give any *three* points of comparison between Text files and Binary files. [6]

(*b*) What are indices ? What are different characteristics of the index file organization ? [4]

(*c*) (*i*) What is a sequential file ?

(*ii*) Give any *two* advantages of sequential files over unordered files.

(*iii*) Explain any *three* operatisons on sequential files in brief. [6]

Or

10. (*a*) What are the differenes between sequential and index sequential files ? [4]

(*b*) Explain the concepts of :

(*i*) Primary indexes

(*ii*) Clustering indexes

(*iii*) Secondary indexes. [6]

(c) Write brief notes on :

(i) Linked organization of a file

(ii) Inverted file organization. [6]

11. (a) Explain the concept of a stack being implemented using :

(i) A Dynamic array

(ii) A linked list. [6]

(b) Give the implementation of a Queue using singly linked list (SLL) with respect to :

(i) Insertion of an element

(ii) Deletion of an element. [6]

(c) What are container adaptor classes ? State the *three* container adaptor classes of standard template library (STL). [4]

Or

12. (a) Explain the typical standard template library (STL) container interfaces (any *three*). [6]

(b) Write short notes on :

(i) Sorting algorithms

(ii) Mutating sequence algorithms

(iii) Non-mutating sequence algorithms. [6]

(c) What is Abstract Data Type (ADT) ? Give stack as ADT . [4]