

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

PAPER ID :

Roll No.

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B. Tech.

(Semester-III) Odd Semester Carry Over Theory Examination, 2012-13

DATA STRUCTURES USING-C

Time : 3 Hours]

[Total Marks : 100

Note : Attempt questions from each Section as per instructions.

SECTION-A

Attempt all parts of this question. Each part carries 2 marks.

2×10=20

1.
 - (a) Differentiate between iteration and recursion.
 - (b) What is a sparse matrix? How sparse matrices can be represented efficiently in memory?
 - (c) What is a Data Type? Differentiate between primitive data type, abstract data type, and polymorphic data type?
 - (d) Which data structure is needed to convert infix notation to postfix notation? Why?
 - (e) How would you detect a loop in a linked list?
 - (f) What do you mean by threaded binary tree?
 - (g) How peek() operation differs from Dequeue() operation?
 - (h) How the height of a binary search tree effect its performance?
 - (i) Compare best case complexity of heap sort with quick sort. Which one is better? What is a collision? How collisions can be handled?

SECTION - B

2. Attempt any three parts of this question. Each part carries 10 marks.

10×3=30

- (a) Write a recursive Quicksort algorithm according to the recipe that the sorting of the shorter partition should be tackled before the sorting of the longer partition. Perform the former task by an iterative statement, the latter by a recursive call.

- (b) Circular lists (Fig. 1) are usually set up with a so-called list header. What is the reason for introducing such a header? Write procedures for the insertion, deletion, and search of an element identified by a given key. Do this once assuming the existence of a header, once without header.

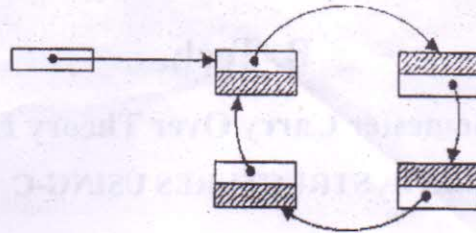


Fig. 1

- (c) Write a c program to perform the following operations on doubly linked list using functions :
- Creation
 - Insertion at the end
 - To remove all duplicate elements
 - Display.
- (d) Work out the Dijkstra's shortest path algorithm on the following Fig. 2.

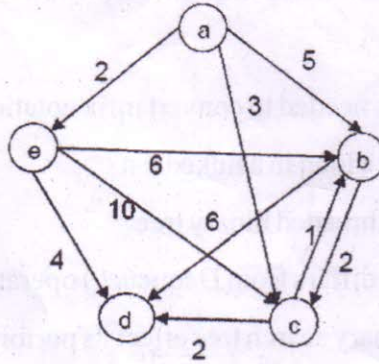


Fig. 2

- (e) Define B-tree of order m. Build a tree by inserting records with the following key sequence F, S, Q, K, C, L, H, T, V, W, M, R, N, P, A, B of order=4.

SECTION-C

Attempt all questions.

3. Attempt any two parts of this question. Each part carries 5 marks. 10×5=50

5×2=10

- (a) What is the relation between the time and space complexities of an algorithm? Justify your answer with an example.

(b) Translate the following infix expression Q into Postfix expression P using STACK.

$$Q : A+(B*C-(D/E\uparrow F)*G)*H$$

(c) Write a C- program to perform PUSH and POP operation on STACK using Linked List.

4. Attempt any one part of this question. Each part carries 10 marks. 10×1=10

(a) Write an algorithm for the insertion and deletion in an CIRCULAR QUEUE

(b) Write a short note on the following :

(i) PRIORITYQUEUE

(ii) Write a general algorithm to add two polynomials expressions.

5. Attempt any one part of this question. Each part carries 10 marks. 10×1=10

(a) What are various operations that can be performed on stacks? Write a C program to solve Tower of Hanoi problem using stacks.

(b) Can you implement Quick Sort method without recursion? If yes show its implementation?

6. Attempt any one part of this question. Each part carries 10 marks. 10×1=10

(a) A binary tree T has 9 nodes. The inorder and preorder traversals of T yield the following sequence of nodes.

Inorder: EACKFHDBG Preorder: FAEKCDHGB

Draw the tree T, State its height and list internal and external nodes.

(d) Consider the graph G in fig (a). Suppose the nodes are stored in memory in an array DATA as follows: $V_0, V_1, V_2, V_4, V_5, V_6$:

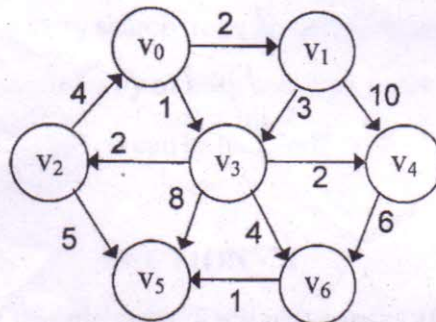


Fig. 3

Draw Minimum Spanning Tree (USING PRIM'S AND DIJKRA'S (KRUSKAL) Algo).

7. Attempt any two parts of this questions. Each part carries 5 marks. 5×2=10

- (a) Compare any three sorting technique with respect to algorithm complexity. Give an algorithm for QUICK sort technique for EVEN number of elements in the series.
- (b) Write a C program that implement quick sort. Also calculate the complexity of quick sort in the worst case?
- (c) Briefly explain any five popular hash functions.

