

(Please write your Exam Roll No.)

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# END TERM EXAMINATION

SECOND SEMESTER (MCA) MAY-JUNE 2009

*Paper Code: MCA-102*

*Paper Id: 44102*

*Subject: Data Structures*

*(Batch: 2004-2008)*

*Time : 3 Hours*

*Maximum Marks:60*

*Note: Q. is compulsory. Intenal choice is indicated.*

(2x10=20)

Q1. Answer any ten from the following:

- (a) Give examples of time-space tradeoff.
- (b) How would you create generic data structures (capable of holding data of any type) in C?
- (c) What are Priority Queues? What are their applications?
- (d) What is the time complexity of insert and delete operations in a linked queue if pointer to the head of the queue is maintained.
- (e) Give an example situation where a duoublestack can utilized more efficiently than two separate stacks.
- (f) Which traversal order would you prefer to clone a BST? Why?
- (g) Demonstrate insert operation in an AVL tree for the key values:  
10, 20, 30, 5 and 7?
- (h) What are decision trees? Where are they used?
- (i) What is Transitive Closure of a graph? How would you generate it?

- (j) A list is ordered from smaller to largest when a sort is called. Which sorting algorithm would take the shortest time to execute? Justify.
- (k) Name an  $O(n)$  sorting algorithm with its drawback?
- (l) Describe any two hash functions.
- (m) What limitations are added to external sort algorithms when the data is stored on tape drives?
- (n) How many disk accesses are required in direct addressing mode of random file organization if the records have variable length? Justify.
- (o) Name a file organization technique that supports batch Operations and range queries efficiently. Justify your choice.

## **UNIT-I**

- Q2. (a) Write a C program that converts a sparse matrix (less than 25% populated) to a linked list of its non-zero entries, ensuring that the original data can be retrieved back from this linked storage. (5)
- (b) Evaluate and compare the average case time complexity Of Binary Search and Linear Search algorithms. (5)

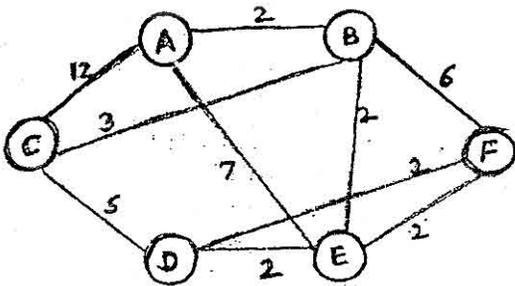
## **OR**

- Q3. (a) Write a C function to merge two sorted linked lists into new sorted list. (5)
- (b) Give any three applications of stacks and queues each in System Programming. (3)
- (c) List advantages and disadvantages of arrays over linked lists. (2)

- Q4. (a) Write a C function to insert a node in a threaded BST. (5)
- (b) What is topological sorting of a graph? Show the working of the topological sorting algorithm (clearly stating the output after each pass) for the graph whose adjacency matrix is given below: (5)

0	0	1	1	1
1	0	0	1	1
0	0	0	0	0
0	0	1	0	1
0	0	1	0	0

- Q5. (a) Write a C program to delete a node from binary search Tree. (5)
- (b) Show the working of Prim's algorithm on the following Graph: (5)



### UNIT-III

- Q6. (a) Demonstrate the working of Shell Sort Algorithm on the Following list taking 5, 3, 1 as increment values: (5)  
22, 7, 5, 1, 10, 9, 20, 12, 35, 16, 11, 8, 3, 25, 6

- (b) Explain the working of balanced K-way merge sort using 2K and K+1 tapes. Explain the advantages and disadvantages of the two approaches. (5)

**OR**

- Q7. (a) Explain various collision resolution techniques, while hashing a set of keys clearly stating their advantages and disadvantages. (5)
- (b) Demonstrate the working of polyphase merge sort with three tapes, give that initial number of sorted run is 55. (4)
- (c) How would polyphase mergesort proceed if the initial number of runs is not a Fibonacci number? (1)

**UNIT-IV**

- Q8. (a) Explain Cylinder surface indexing and the mechanism used for searching a record using this indexing technique. (5)
- (b) Explain the usage of cellular partitions for organizing file storage. How can this technique be used for improving efficiency of read write operations? (4)
- (c) While searching a key, how is number of disk accesses related to the order of a tree in tree based indexes? (1)

**OR**

- Q9. (a) Explain inverted file organization, how is it different from regular files and indexes? List its advantages and disadvantages. (4)
- (b) Explain tree based indexing using m-way trees. (6)

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