

BCA

DSA in C/C++

BCA 4th Semester Exam., 2015

FILE AND DATA STRUCTURE

Time : 3 hours

Full Marks : 100

Instructions :

- (i) The marks are indicated in the right-hand margin.

- (ii) There are SEVEN questions in this paper.

- (iii) Attempt **FIVE** questions in all.

- (iv) Question Nos. 1 and 2 is compulsory.

1. Choose the correct option/Answer/Fill in the blanks (any six) :

$$(a) \text{The frequency count of the statement } " \text{for } K = 3 \text{ to } [m+2] \text{ do }" \text{ is } \\ - - 2 \times 6 + 12$$

$$(b) \text{The frequency count of the statement } " \text{for } K = 3 \text{ to } [m+2] \text{ do }" \text{ is } \\ - - 2 \times 6 + 12$$

$$(c) \text{The frequency count of the statement } " \text{for } K = 3 \text{ to } [m+2] \text{ do }" \text{ is } \\ - - 2 \times 6 + 12$$

$$(d) \text{The frequency count of the statement } " \text{for } K = 3 \text{ to } [m+2] \text{ do }" \text{ is } \\ - - 2 \times 6 + 12$$

$$(e) \text{The frequency count of the statement } " \text{for } K = 3 \text{ to } [m+2] \text{ do }" \text{ is } \\ - - 2 \times 6 + 12$$

$$(f) \text{The frequency count of the statement } " \text{for } K = 3 \text{ to } [m+2] \text{ do }" \text{ is } \\ - - 2 \times 6 + 12$$

$$(g) \text{The frequency count of the statement } " \text{for } K = 3 \text{ to } [m+2] \text{ do }" \text{ is } \\ - - 2 \times 6 + 12$$

2. Answer any three of the following questions :

$$4 \times 3 = 12$$

- (a) For the array A with $a = 220$ as the base address, find the address of the element specified in $A[-2 : 4, -6 : 10]$.

- (b) The complexity of binary search algorithm is _____.

- (d) Linear search is performed on a sorted array.

- (i) True
(ii) False

- (e) What is the postfix equivalents of the given infix expression?

$$A * B + C / D$$

- (f) Find out the infix equivalents of the given postfix equivalents :

$$ABC * + D -$$

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- (g) Reverse polish notation is the other name of _____.

- (h) Degree of a leaf node is _____.

- (i) The depth of root node is _____.

- (j) A binary tree of height h has at least h nodes and almost _____ nodes.

$$(m-1)$$

$$(m)$$

$$(m+1)$$

$$(m+2)$$

3. Answer any three of the following questions :

$$4 \times 3 = 12$$

- (a) Compare among best case, average case and worst case complexities with example.

- (b) How to analyze recursive programs? Explain with an example.

(c) Give the advantages and uses of a circular linked list.

(d) How does linked stack differ from linear array?

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(e) Explain preorder, postorder and inorder traversals of a tree with an example.

3. What do you mean by complete binary tree and extended binary tree? Construct a binary tree from the given inorder and preorder traversals :

*Inorder : E A C K F H D B G
Preorder : F A E K C D H G B*

12

4. Define m -way search tree. How do insertion and deletion operations performed in an m -way search tree?

12

5. Explain heapsort with an example. Also discuss its complexity.

12

6. Discuss the sequential representation of graphs.

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12

7. Explain linear search and binary search with example. Also discuss its time complexity.

12

Code : 303403

BCA 4th Semester Theory Examination, 2017 File & Data Structure

Time : 3 hours

Full Marks : 60

Instructions :

- (i) The questions are of equal value.
 - (ii) There are seven questions in this Paper.
 - (iii) Attempt five questions in all.
 - (iv) Question No. 1 & 2 is compulsory.
1. Choose the correct answer (any six)
 - (a) Explain the difference between time complexity and space complexity of an algorithm.
 - (b) Compare a link list with an array.
 - (c) Why is a double linked list is more useful than a single linked list explain?
 - (d) Write an algorithm for traversing a single link list.
 - (e) Explain the difference between a circular link list and a single link list.
 - (f) Explain the difference between stack and queue.
 - (g) How a binary search tree is different from binary tree explain?

(h) What is complexity of an algorithm? Explain with example.

(i) Translate the infix expression $(A-B)^*(D/E)$ into equivalent postfix expression.

(j) Explain the difference between directed and undirected graph.

2. Answer any three of the following:

- (a) Discuss the best case, worst case and average complexity of an algorithm.
- (b) What is sorting? Explain Bubble sort with example.
- (c) Write an algorithm for post order traversal of a binary tree. <https://www.akubihar.com>
- (d) What is a graph? Explain its key terms.
- (e) Consider the following stack where stack is allocated in memory cells Stack: AAA, BBB,
Describe the stack as the following operation take place:
 - (a) Pop(Stack, item)
 - (b) push(Stack, EEE)
 - (c) pop(Stack, item)

5. What is stack? Explain the different way through which we can implement the stack.
6. What is Binary tree? What are the different methods of traversing a binary tree? Explain with an example.
7. What are the difference between linear search and binary search? Write an algorithm for linear search.

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Code : 303403

BCA 4th Semester Exam., 2018

FILE AND DATA STRUCTURE

Time : 3 hours Full Marks : 60

Instructions:

- (i) All questions carry equal marks.
 - (ii) There are **SEVEN** questions in this paper.
 - (iii) Attempt **FIVE** questions in all.
 - (iv) Question Nos. 1 and 2 are compulsory.
1. Answer the following questions (any six) :
- (a) What is Big O notation? Explain.
 - (b) What is dynamic memory allocation? How is it different from static memory allocation?
 - (c) Construct a binary tree for the expression, $\exp = (a - b) + (c * d)$.
 - (d) What do you understand by stack overflow and stack underflow?
 - (e) Differentiate between push() and pop() functions.

(Turn Over)

2. Answer any three of the following :
- (a) Discuss the best case, worst case and average case complexity of an algorithm.
 - (b) Write an algorithm to print the number of nodes in a linked list.
 - (c) Explain the difference between linear and binary search.
 - (d) Write an algorithm for PUSH() and POP() operations.

(3)

(e) Suppose a 10-element array A contain the values a_1, a_2, \dots, a_{10} . Find the value of A after loop :

(i) Repeat for K=1 to 9

Set A[K+1]=A[K]

[End of loop]

(ii) Repeat for K=1 to 9

Set A[K+1]=A[9]

[End of loop]

3. What is data structure? What are the different operations that can be performed on data structure? <https://www.akubihar.com>

4. Write an algorithm for inserting a new node at beginning and end of a single linked list.

5. What is stack? What are the different possible operations can be possible in stack? Explain.

6. What is graph? Explain the different traversal algorithms are used in graph.

7. What is tree? Explain the different algorithms are used for the traversal of binary tree.

Code : 303403

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BCA 4th Semester Exam., 2019

FILE AND DATA STRUCTURE
Time : 3 hours Full Marks : 60

Instructions :

- (i) The marks are indicated in the right-hand margin.
 - (ii) There are **SEVEN** questions in this paper.
 - (iii) Attempt **FIVE** questions in all.
 - (iv) Question Nos. **1** and **2** are compulsory.
1. Choose the correct answer (any six) : $2 \times 6 = 12$
- (a) Which data structure allows deleting data elements from front and inserting at rear?
 - (i) Stack
 - (ii) Queue
 - (iii) Dequeue
 - (iv) Binary search tree

- (b) Which of the following is non-linear structure?
(i) Stack
- (ii) List
- (iii) String
- (iv) Tree

- (c) Which of the following data structures is linear type?
(i) Graph

- (ii) Tree

- (iii) Binary tree

- (iv) Stack

- (d) Inserting an item into the stack when stack is not full is called _____ operation and deletion of item from the stack when stack is not empty is called _____ operation.

- (i) push, pop
- (ii) pop, push

- (iii) insert, delete

- (iv) delete, insert

(Turn Over)

(e) _____ is not the operation that can be performed on queue.

- (i) Insertion
- (ii) Deletion
- (iii) Retrieval
- (iv) Traversal

(f) In _____, search starts at the beginning of the list and checks every element in the list.

- (i) linear search
- (ii) binary search
- (iii) hash search
- (iv) binary tree search

(g) To represent hierarchical relationship between elements, which data structure is suitable?

- (i) Dequeue
- (ii) Priority
- (iii) Tree
- (iv) Graph

(h) _____ is not the component of the structure.

- (i) Operation
- (ii) Storage structure
- (iii) Algorithm
- (iv) None of the above

(i) Stack is also called as

- (i) last in first out
- (ii) first in last out
- (iii) last in last out
- (iv) first in first out

(j) Which of the following is/are the level(s) of implementation of data structure?

- (i) Abstract level
- (ii) Application level
- (iii) Implementation level
- (iv) All of the above

(5)

2. Answer any three of the following : 4×3=12

(a) Briefly explain the approaches to develop algorithms.

(b) What are some examples of divide and conquer algorithms?

(c) What is binary search?

(d) What is tree traversal?

3. Explain algorithm and its characteristics. 12

4. What are static memory allocation and dynamic memory allocation? 12

5. What is linked list? Explain its advantages and disadvantages. 12

6. What is a stack? Explain its applications. 12

7. What is graph? Explain DFS (Depth First Search). 12

Code : 303403

(2)

BCA 4th Semester Exam., 2023

FILE AND DATA STRUCTURE

Time : 3 hours Full Marks : 60

Instructions:

- (i) The marks are indicated in the right-hand margin.
 - (ii) There are SEVEN questions in this paper.
 - (iii) Attempt FIVE questions in all.
 - (iv) Question Nos. 1 and 2 are compulsory.
1. Choose the correct answer (any six) : $2 \times 6 = 12$
- (a) The data structure required to check whether an expression contains a balanced parenthesis is
 - (i) stack
 - (ii) queue
 - (iii) array
 - (iv) tree
 - (b) Which of the following is false about a doubly linked list?
 - (i) We can navigate in both the directions
 - (c) Which of the following properties is associated with a queue?
 - (i) First In Last Out
 - (ii) First In First Out
 - (iii) Last In First Out
 - (iv) Last In Last Out
 - (d) What is the time complexity of an infix to postfix conversion algorithm?
 - (i) $O(N \log N)$
 - (ii) $O(N)$
 - (iii) $O(N^2)$
 - (iv) $O(M \log N)$
 - (e) The number of edges from the root to the node is called ____ of the binary tree.
 - (i) height
 - (ii) depth
 - (iii) length
 - (iv) width

(Continued)

(3)

- (f) Which of the following is false about a binary search tree?
- (i) The left child is always lesser than its parent
 - (ii) The right child is always greater than its parent
 - (iii) The left and right sub-trees should also be binary search trees
 - (iv) In order sequence gives decreasing order of elements
- (g) What is the number of edges present in a complete graph having n vertices?
- (i) $(n * (n + 1)) / 2$
 - (ii) $(n * (n - 1)) / 2$
 - (iii) n
 - (iv) Information given is insufficient
- (h) To implement a stack using queue (with only enqueue and dequeue operations), how many queues will you need?
- (i) 1
 - (ii) 2
 - (iii) 3
 - (iv) 4

24AK/37

(Turn Over)

(4)

- (i) Which matrix has most of the elements (not all) as zero?
- (ii) Identity matrix
 - (iii) Unit matrix
 - (iv) Sparse matrix
 - (v) Zero matrix
- (j) How many children does a binary tree have?
- (i) 2
 - (ii) Any number of children
 - (iii) 0 or 1 or 2
 - (iv) 0 or 1
2. Answer any *three* of the following : 4×3=12
- (a) Explain reverse polish notation.
 - (b) Write algorithm for DFS.
 - (c) Explain heap sort.
 - (d) Differentiate stack and queue.
 - (e) Explain B tree.
3. Describe AVL tree. Explain four types of rotation AVL tree performs. 12

24AK/37

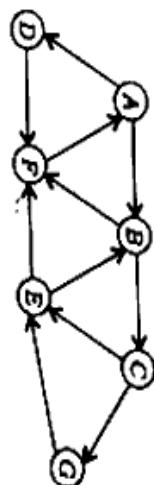
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(5)

4. What are the basic operations supported by an array? Write algorithm or program for insert operation in an array. 12
5. Consider the graph G shown below and calculate the minimum path p from node A to node E . Given that each edge has a length of 1 :
- Adjacency Lists
- | |
|------------|
| $A : B, D$ |
| $B : C, F$ |
| $C : E, G$ |
| $G : E$ |
| $E : B, F$ |
| $F : A$ |
| $D : F$ |
6. Define singly linked list. Explain the traversing and searching in singly linked list with algorithm. 12
7. What are the characteristics of algorithm? How is the efficiency of an algorithm analyzed? Also define algorithm complexity. 12



**MCA
(SEM II) THEORY EXAMINATION 2022-23
DATA STRUCTURES & ANALYSIS OF ALGORITHMS**

Time: 3 Hours

Total Marks: 100

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A**1. Attempt all questions in brief.**

2 x 10 = 20

- (a) Describe the Big Oh notation.
- (b) Differentiate between array and linked list.
- (c) Let J and K be integers and suppose Q(J,K) is recursively defined as

$$Q(J,K) \triangleq \begin{cases} 5 & \text{if } J < K \\ Q(J-K, K+3) + J & \text{if } J \geq K \end{cases}$$

Find Q(4,7).

- (d) Consider the following linear queue capable of accommodating maximum five elements. Front = 2 Rear = 4 Queue _ L, M, N

Compute following operations

- (i) Add O (ii) Add P (iii) Delete two letters (iv) Add Q, R

- (e) What do you mean by non-comparison sort? List two non-comparison sort algorithms.

- (f) Apply selection sort algorithm on given data to sort in ascending order:-

5,8,6,2,1,3

- (g) Discuss the concept of inorder "successor" and inorder "predecessor" in Binary Search Tree.

- (h) Give static and dynamic memory representation of binary tree

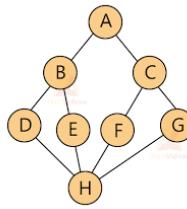
- (i) How dynamic programming approach is better from recursive programming approach

- (j) What is the role of a negative cycle, while you are computing the shortest path in the graph

SECTION B**2. Attempt any three of the following:**

10x3=30

- (a) Discuss how two-dimensional array can be stored in the memory and compute the following. An array Arr[50][100] is stored in the memory along the row major with each element occupying 4 bytes of memory. Estimate the address of the location Arr[20][50], if the base address 1000.
- (b) Write down algorithm to evaluate postfix expression and also evaluate given postfix expression using the algorithm.
10, 7 + 30, 6 * 8 -
- (c) Discuss various methods to represent graph in the memory. Also write down algorithm to do DFS in the graph. Apply that algorithm on given graph to compute DFS Tree



- (d) What is AVL tree? What is balancing factor? Explain balancing method of AVL tree with all possible cases with suitable example
- (e) How Strassen's matrix multiplication provide better time complexity over classical matrix multiplication algorithm. Apply the Strassen's algorithm method on the following matrix $\begin{bmatrix} 1 & 5 \\ 7 & 3 \end{bmatrix}$ and $\begin{bmatrix} 8 & 2 \\ 6 & 4 \end{bmatrix}$.

SECTION C**3. Attempt any one part of the following:**

10x1=10

- (a) How to represent linked lists in memory provide their self-referential structure and proper diagram

- (i) Single linear Linked List
- (ii) Doubly linear Linked List
- (iii) Circular Doubly Linked List
- (iv) Header Linked List

- (b) Give an algorithm or C function to perform following operations on single linear linked list

- (i) Insert a node after a given node

- (ii) Delete a node from end

4. Attempt any one part of the following:

10x1=10

- (a) What do you understand by hashing? What are the different hashing techniques? Discuss different techniques to resolve collision once it is occurred during hashing.

- (b) Write a 'C' program to implement two stacks in a single array. One stack will grow from one end of the array and second stack will grow from the other end of the array. User need to implement following functions

- (i) Push in specific stack
- (ii) Pop from Specific stack
- (iii) Handing overflow and underflow cases

5. Attempt any one part of the following:

10x1=10

- (a) Write heap sort algorithm and draw the max-heap only for following data

- 1,2,3,4,5,6,7,8,9,10

- (b) Write down Quick Sort Algorithm and apply it on following data to sort it.

- 5,8,7,6,3,4,1,9,2,10

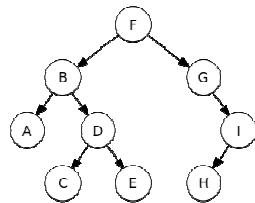
6. Attempt any one part of the following:

10x1=10

- (a) Write down recursive algorithm to insert a node in binary search tree. And apply that algorithm to construct BST with given data.

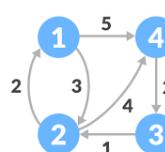
8,5,12,6,7,4,3,23,6,3,2,8,24,21,20

- (b) Demonstrate the traversal of the following tree in Pre-Order, Post-Order and In-Order. Also write recursive algorithms of three traversals.

**7. Attempt any one part of the following:**

10x1=10

- (a) Write down algorithm of Floyd-Warshall to compute all pair shortest path in the graph. Also apply it on following graph



- (b) Discuss the applications of longest common subsequence (LCS). Determine the LCS of <1,0,0,1,0,1,0> and <0,1,0,1,1,0,1,0>

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably

SECTION A**1. Attempt all questions in brief.**

2 x 10 = 20

- a. Define the Basic Data Structure operations.
- b. When recursion is suitable for a given problem? Give example.
- c. Write some real-life examples of Stack and Queue data structure.
- d. Why analysis is important for different algorithms?
- e. Write the time complexities of Bubble Sort, Quick Sort.
- f. What do you mean by Traversal of a Tree?
- g. Define the B-Tree with basic properties.
- h. Write the different ways of storing Graphs in computer memory.
- i. What are the basic properties of Binary Search Tree?
- j. In a binary tree who we can find the successor of a given node?

SECTION B**2. Attempt any three of the following:**

10x3=30

- a. Define the STACK data structure. Write an algorithm to PUSH and POP operation. Write a procedure SORT, which sorts a linked list without changing any value in information field of the node.
- b. Define the two-way linked list. Discuss the advantages of two-way linked list over the one-way linked list in case of deleting a node whose location LOC is given.
- c. Write an Algorithm to convert the Infix Expression to Postfix Expression.
- d. Write a program in "C" to find the Greatest Common Divisor of given two nos.

SECTION C**3. Attempt any one part of the following:**

10x1=10

- a. What is a Hash function? Also discuss a collision resolution strategy in hashing with suitable example.
- b. Write a program in C to delete duplicate value from a given array.

4. Attempt any one part of the following:

10x1=10

- a. Draw binary tree of the following expression:
 - (i) $(A-B)^*(C-D)$
 - (ii) $(A \cdot B \cdot C)^*(D \cdot E \cdot F)$
- b. Define queue. Write a program in C to insert an element in an already existing queue. Make suitable assumptions yourself.

5. Attempt any one part of the following:**10x1=10**

- a. Write procedure of operations:

- (i) B-Tree Search
- (ii) B-Tree Insert

- b. Write a program in C which sorts a list of n items using insertion sort method. Illustrate your algorithm with an example.

6. Attempt any one part of the following:**10x1=10**

- a. Illustrate the execution of HEAP-SORT on the array.

$$A = \{6, 14, 3, 25, 2, 10, 20, 7, 6\}$$

- b. Write quick sort algorithm. Explain your algorithm taking suitable example. Analyze its running time.

7. Attempt any one part of the following:**10x1=10**

- a. Write short notes on the following:

- (i) AVL Tree
- (ii) Big-Oh Notation

- b. Explain B⁺ tree index files and B tree index files in detail.

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Printed pages: 02

Paper Id: 214221

Roll No: _____

MCA

(SEM II) THEORY EXAMINATION 2018-19

DATA STRUCTURE USING C

Time: 3 Hours

Total Marks: 100

- Note: 1. Attempt all Sections. If require any missing data; then choose suitably.
2. Any special paper specific instruction.

SECTION A

1. Attempt all questions in brief.**2 x10 = 20**

- a. Define asymptotic notations.
- b. Define sparse matrix.
- c. Explain Garbage Collection and Compaction with example.
- d. Define recursion. Explain the function of recursion.
- e. Define Priority Queue.
- f. What are the operations perform on data structures.
- g. Explain Cycle and Hamilton cycle in graph.
- h. Differentiate between Binary Tree and complete Binary Tree.
- i. What is graph? List the various representations of graph?
- j. Define PUSH and POP operations in stack.

SECTION B

2. Attempt any three of the following:**10 x 3 = 30**

- a. What do you mean by Data Structures? Explain linear and non- linear data structures with example.
- b. Write an algorithm and or a C function to reverse a single linked list.
- c. Write a short note on Huffman algorithm explaining various steps with example.
- d. What is AVL tree? Explain the balancing methods of AVL trees with an example.
- e. Explain the Kruskal's algorithm to find out minimum cost spanning tree with an example.

SECTION C

3. Attempt any one part of the following:**10 x 1 = 10**

- (a) Each element of an array Data [20][50] requires 4 bytes of storage. Base address of data is 2000. Determine the location of Data [10][10] when the array is stored as
- (i) Row major
 - (ii) Column major

- (b) Write an algorithm to evaluate postfix expression using stack. And also evaluate following postfix expression by using stack:

$$6 \ 2 \ 3 \ + \ - \ 3 \ 8 \ 2 \ / \ * \ 2 \uparrow \ 3 \ +$$

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4. Attempt any one part of the following:**10 x 1 = 10**

- (a) Define Queue also write the algorithm for insertion and deletion of element in a Queue.
(b) How a polynomial equation can be represented through link list? Explain the method to add two given polynomial equations using link list.

5. Attempt any one part of the following:**10 x 1 = 10**

- (a) What is Threaded Binary Tree? Explain the advantages and disadvantages of using this Tree.
(b) Define Hash function. Explain Collision resolution strategies.

6. Attempt any one part of the following:**10 x 1 = 10**

- (a) What is binary search tree? Write an algorithm to implement for recursive search or iterative search for a binary search tree.
(b) Write the algorithm for quick sort. Using quick sort algorithm to sort following elements.

$$36, 15, 40, 1, 60, 20, 55, 25, 50, 20 .$$

7. Attempt any one part of the following:**10 x 1 = 10**

- (a) Write the difference between a B-tree and B⁺tree. When you might prefer to use B⁺ tree instead of a B-tree?
(b) Briefly explain basic operations that can be performed on a file. Explain indexed and sequential file organization.

Page 2 of 2

Printed pages: 02

Paper Id: 214204

Roll No: _____

MCA

(SEM II) THEORY EXAMINATION 2018-19

DATA STRUCTURES AND FILE HANDLING

Total Marks: 100

- Note: 1. Attempt all Sections. If require any missing data; then choose suitably.
2. Any special paper specific instruction.

SECTION A

1. Attempt all questions in brief.**2 x10 = 20**

- a. Explain the different ways of analyzing algorithm.
- b. '
- c. Define sparse matrix.
- d. What is the Tower of Hanoi problem?
- e. Define Dequeue and priority queue.
- f. What is binary search tree? Define its property.
- g. Compare B tree and B⁺ tree.
- h. Define Graph. List some applications of the graph.
- i. Explain Cycle and Hamilton cycle in graph.
- j. Differentiate between Array and Lists.

SECTION B

2. Attempt any three of the following:**10 x 3 = 30**

- a. Define Data structure and also write down the primitive and non-primitive data structure in detail with examples.
- b. Why circular queues are better than simple queue? Write an algorithm to insert and delete an item from the circular queue.
- c. Define quick sort. Illustrate the quick sort algorithm with a suitable example.
- d. Define Hash function. Explain Collision resolution strategies. How collision is resolved using separate chaining concept?
- e. Write and explain the breadth first search and depth first search traversal algorithm. What are their complexities?

SECTION C

3. Attempt any one part of the following:**10 x 1= 10**

- (a) Discuss solutions of the Tower of Hanoi problem where the numbers of disks are 3 and numbers of pegs/rods are 3. Also write its algorithm.
- (b) Write an algorithm for binary search and discuss its speed compared with linear search.

4. Attempt any one part of the following: **10 x 1 = 10**
- What is doubly linked list? Write an algorithm to add an element in the doubly linked list before the given element.
 - Discuss Huffman's algorithm with example.
5. Attempt any one parts of the following: **10 x 1 = 10**
- What is threaded binary tree? Explain the important types of threaded binary tree.
 - The pre-order and in-order traversal of binary tree is given below, construct the tree:
preorder:-FAEKCDHGB
in-order:-EACKFHDBG
6. Attempt any one part of the following: **10 x 1 = 10**
- What is searching and sorting? Write an algorithm for linear search and binary search.
 - Write the algorithm for the merge sort. Explain its complexities, sort the following elements using merge sort:
75,10,20,70,80,90,100,40,30,50
7. Attempt any one part of the following: **10 x 1 = 10**
- Define spanning tree. Describe the Dijkstra's algorithm for finding shortest path with the help of suitable example.
 - What is compaction and garbage collection? What are the different techniques of garbage collection?

CA204

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Printed pages: 02
Paper Id: 214234
Sub Code: RCA 202
Roll No:

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(SEM II) THEORY EXAMINATION 2018-19
DATA STRUCTURES

Time: 3 Hours

Total Marks: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.
2. Any special paper specific instruction.

SECTION A

1. Attempt all questions in brief. **2 x 7 = 14**
- What is a sparse matrix? Also give its important properties.
 - Discuss the differences between Array and lists.
 - Write two applications of Linked Lists.
 - Explain a method to store a graph in computer.
 - Explain Complete Binary Tree and Extended Binary Tree.
 - Differentiate between directed and Undirected graph.
 - Explain Garbage Collection with example.

SECTION B

2. Attempt any three of the following: **7 x 3 = 21**
- What do you understand by complexity of an algorithm? Describe the different notations used to describe the asymptotic running time of an algorithm.
 - How a linked list can be used to represent a polynomial $5x^3 + 4x^2 + 3x + 2$? Give an algorithm to perform addition of two polynomials using linked list.
 - What is AVL tree? Explain the balancing methods of AVL trees with an example.
 - Compare Linear search and Binary search algorithms with examples with their complexities.
 - Describe the minimum cost spanning tree with suitable example.

SECTION C

3. Attempt any one part of the following: **7 x 1 = 7**
- Define Stack. Convert the expression **infix to prefix** using stack:
A*(B+D)/E-F*(G+H/K).
 - What is the Tower of Hanoi problem? Explain the solutions of the Tower of Hanoi problem where the numbers of disks are 3 and numbers of pages are 3.
4. Attempt any one part of the following: **7 x 1 = 7**
- Explain circular queue and Double ended queue with example.
 - Give an algorithm to perform following operations in a singly linked list.
 - Insert a new node after a given node.
 - Delete last node.

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5. Attempt any one part of the following: **7 x 1 = 7**
- How records are organized into blocks? Discuss any one method for the same with an example.
 - What is threaded binary tree? Explain the operation of threaded binary tree.
6. Attempt any one part of the following: **7 x 1 = 7**
- Write algorithm for Insertion sort. Also illustrate insertion sort with an example.
 - Write an algorithm for heap sort technique. Illustrate with an example.
7. Attempt any one part of the following: **7 x 1 = 7**
- Define hashing. What are the properties of a good hash function? With necessary examples explain four different hashing techniques.
 - Write a note on the following: (i) B+ tree. (ii) Internal sorting.

Printed Pages: 02
Paper Id: 214212
Sub Code: NMCA 213
Roll No:

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MCA
(SEM II) THEORY EXAMINATION 2017-18
Data Structure Using C

Time: 3 Hours Total Marks: 100
Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief. **2 x 10 = 20**
- Compare Primitive and non-primitive data structure with example.
 - Define stack and queue with proper example.
 - Write an algorithm to transpose a matrix.
 - Define graph, connected-graph and planer graph.
 - Define non-linear data structure? List the basic operations carried out in a linked list.
 - Write C code to find the factorial of a given number using iterative method.
 - Define some primitive data types.
 - Write a short note on balanced binary tree.
 - Discuss space and time complexity of insertion sorting.
 - Write the time complexity of quick sort.

SECTION B

2. Attempt any three of the following: **10 x 3 = 30**
- Define Data structure. What is the role of data structure in computer science? Explain.
 - Define recursion. When it is Good and Bad, explain with suitable example.
 - Define priority queue data structure. Write the algorithms for insertion and deletion operation.
 - What is stack? What are its applications? Reverse the string with the help of stack.
 - Write a C code to find the multiplication of two matrix $A_{3 \times 3}$ and $B_{3 \times 3}$. Also fine its time complexity

SECTION C

3. Attempt any one part of the following: **10 x 1 = 10**
- Illustrate the execution of INSERTION-SORT on the array.
 $A = <16,4,13,5,2,10,30,17,6>$
 - Write an algorithm to sort a list of n items using Merge sort method. Illustrate your algorithm with an example.
4. Attempt any one part of the following: **10 x 1 = 10**
- What is a Data Structure? What are the factors that influence the choice of a particular data structure?
 - Differentiate Between Iteration & Recursion using suitable example.

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5. Attempt any one part of the following: **10 x 1 = 10**
- Write an Algorithm to convert the Infix Expression to Postfix Expression.
 - Convert the following infix expression into prefix expression:
((8+9)*5+(1*(2+3)*7)+12).
6. Attempt any one part of the following: **10 x 1 = 10**
- Write a procedure SORT, which sorts a linked list without changing any value in information field of the node.
 - Suppose a linked list consists some numeric values. Design an algorithm to find maximum value in the list.
7. Attempt any one part of the following: **10 x 1 = 10**
- Define the inorder traversing. Write an algorithm/program for inorder traversing method.
 - What is Sparse matrix? How sparse matrices could be represented in memory efficiently?

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Paper Id: 2 | 1 | 4 | 2 | 2 | 2

Sub Code: RCA202
Roll No. _____

MCA
(SEM II) THEORY EXAMINATION 2017-18
DATA STRUCTURES

Time: 3 Hours **Total Marks: 70**
Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief. **2 x 7 = 14**
- What are the data structures used to perform recursion?
 - State the difference between stacks and linked lists?
 - Translate the following infix expression into its equivalent postfix expression by showing all steps (A-B)/(D+E)*F)
 - Define the terms binary tree, complete binary tree and threaded binary tree?
 - What is a heap? How does heap sort work?
 - Write Short Note on Indexing and Hashing in file structures?
 - Write a program for insertion sorting. Analyze its running time ?

SECTION B

2. Attempt any three of the following: **7 x 3 = 21**
- Write an algorithm to convert in the infix expression to postfix Expression?
 - Write a program of binary search. Analyze its running time. ?
 - Write a C program to perform Merge sort and analyze time complexity of the algorithm?
 - Is it possible to implement a queue with the help of two Stacks? Explain.
 - Define a B tree. Construct a B tree of order 3 by inserting following keys in the order shown into an empty B tree.
M Q A N P W X T G E J

SECTION C

3. Attempt any one part of the following: **7 x 1 = 7**
- Define Sparse Matrices? How Sparse Matrices can be represented?
 - Explain recursion. Write a recursive algorithm to calculate the factorial of a number. Also calculate the time complexity of this routine.
4. Attempt any one part of the following: **7 x 1 = 7**
- What is a circular queue? Write the implementation of circular queues using arrays and also write the methods to perform insertion, deletion and display on it.
 - Explain various garbage collection and compacting techniques.
5. Attempt any one part of the following: **7 x 1 = 7**
- What is tree data structure? Explain different ways to traverse a Tree.
 - Define AVL tree. Explain the different types of rotation done in AVL tree.

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6. Attempt any one part of the following: **7 x 1 = 7**
- Define Searching. What do you mean by Linear Search and Binary Search explain it with its complexity?
 - Write Short Note on (1) Heap Sort & (2) Bubble Sort along with their comparison and analysis?
7. Attempt any one part of the following: **7 x 1 = 7**
- What are the different ways the graph is represented in computer memory? Explain with suitable example.
 - Explain the minimum spanning tree algorithms with an example.

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Printed Pages: 3	318	NBC202
1944		(Following Paper ID and Roll No. to be filled in your Answer Book)
PAPER ID: 194402		Roll No. _____
M.C.A. (Dual Degree) (Semester-II) SPL. THEORY EXAMINATION, 2014-15 DATA STRUCTURE USING 'C'		
<i>[Total Marks : 100]</i>		
<i>Time : 3 Hours</i> Note: Attempt all the questions. All questions carry equal marks. 4x5=20		
1. Attempt any four parts of the following: (a) What is a Data Structure? What are the factors that influence the choice of a particular data structure? (b) Write an Algorithm to convert the Infix Expression to Postfix Expression. (c) What do you understand by time complexity of an algorithm? Explain Big O Notation. (d) Write a program to delete duplicate value from a given array		

<p>5. Attempt any two parts of the following :</p> <ul style="list-style-type: none"> a) Write Dijkstra algorithm for finding the shortest path from a source vertex. b) Explain B* tree index files and B tree index files in detail. c) Write short notes on the following : <ul style="list-style-type: none"> (i) Tree Rotation (ii) Indexed sequential files 	<p>10×2=20</p>	<p>368</p>	<p>NMCA-213</p>
			(Following Paper ID and Roll No. to be filled in your Answer Book) PAPER ID : 214220
		Roll No.	<input type="text"/>
		M.C.A.	
		(SEM-II) THEORY EXAMINATION 2014-15	
		Data Structure Using 'C'	
		<i>Time : 3 Hours / Total Marks : 100</i>	
		Note: All questions are compulsory.	
	<p>—X—</p>	<p>5×4=20</p>	
	<p>1. Attempt any four parts of the following:</p>	<p>a) What is a Data Structure? What are the factors that influence the choice of a particular data structure.</p>	
		<p>b) What do you mean by degree of node and degree of the tree.</p>	
		<p>c) Obtain addressing formula for an element in three dimensional array represented in column major order.</p>	
		<p>d) Write an Algorithm to convert the Infix Expression to Postfix Expression.</p>	
<p>214220]</p>	<p>(4)</p>	<p>700</p>	<p>214220] (1)</p>
			<p>[Contd...]</p>

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PAPER ID : 214220

Roll No.

MCA
(SEM. II) THEORY EXAM. 2014-15
DATA STRUCTURES USING C

Time : 3 Hours]

[Total Marks : 106]

Note : Attempt the questions as indicated.

- Q1.** Attempt any *four* questions from the following : 5x4=20

- (a) Consider the following C code segment.

```
int IsPrimo(n);
```

1

int i, m;

```
for (j = 2; j <= sqrt(m); j++)
```

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1

[Contd]

```

is(m % i == 0)

    {printf("Not Prime\n");
     return 0; }

return 1;
}

```

Let $T(m)$ denote the number of times the *for* loop is executed by the program on input m . Find the complexity of the code.

- (b) Suppose multidimensional arrays A and B are declared using

$A(-2:2, 2:2)$ and $B(1:8, -5:5, -10:5)$

Consider the element $B(3, 3, 3)$ in B . Find the effective indices E_1, E_2, E_3 and the address of the element, assuming $\text{Base}(B) = 400$ and there are $w = 4$ words per memory location.

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2

[Contd...]

- (d) Write a function in C to find the largest element in an array.
- (e) Translate the following infix expression into its equivalent postfix expression by showing all steps
- $$(A - B) / ((D + E) * F)$$
- (f) Define recursion. What is the complexity of the following recursive function? Int DoSomething (int n) {
- ```

If(n <= 2)
 return 1;
else
 return (DoSomething (floor(sqrt(n))) + n);
}

```

Q2. Attempt any *four* questions from the following :  $5 \times 4 = 20$

- (a) Describe the three types of structures used for storing strings.
- (b) Is it possible to implement a queue with the help of two stacks? Explain.

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3

[Contd...]

- (c) What do you mean by circular queue? How is it different from a simple queue? Show how an element is deleted from a circular queue.
- (d) Write a C function to delete the  $k^{\text{th}}$  element from a linked list, where  $k$  is an integer.
- (e) Why is it more difficult to move backward than forward in a linked list?
- (f) What do you mean by doubly-linked list? Explain with an example.

Q3. Attempt any *two* questions from the following :  $10 \times 2 = 20$

- (a) Define the terms binary tree, complete binary tree and threaded binary tree. Also give an example of each.
- (b) Name the three conditions under which sequential search of a list is preferable to binary search. Why was binary search implemented only for contiguous lists, not for linked lists?

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[Contd...]

- (c) What is Hash function? Name three techniques often built into Hash functions. Name four advantages of a chained Hash table over open addressing.

Q5. Attempt any *two* questions from the following :  $10 \times 2 = 20$

- (a) How many comparison of keys are required to verify that a list of  $n$  entries is in order? When are simple sorting algorithms better than sophisticated ones? Explain.

- (b) What is a heap? How does heapsort work? Sort the following seven numbers into increasing order using heapsort.

12, 19, 33, 26, 29, 35, 22

- (c) Define a B tree. Construct a B tree of order 3 by inserting following keys in the order shown into an empty B tree.

M Q A N P W X T G E J

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[Contd...]

**Q5.** Attempt any **two** questions from the following : 10x2=20

- What is the difference between an undirected graph and directed graph? Describe the different ways to implement graphs in computer memory.
- Define spanning tree of a graph. What is minimum spanning tree? Discuss any one method for finding the minimum spanning tree of a graph.
- Write short notes on the following :
  - Sparse matrices
  - Indexing of files

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6

[ JJ5 ]

- What is stack? What are its applications? Reverse the string with the help of stack.
- Write an algorithm to convert in the infix expression to postfix expression.
- Attempt any **four** parts of the following : 5x4=20
  - Write an algorithm to find transpose of matrix.
  - Distinguish between static memory allocation and dynamic memory allocation.
  - Write an algorithm to evaluate a postfix expression.
  - Write the sequential search and binary search algorithm. Compare both of the algorithms.
  - Delete duplicate value from a given array.

**Q3.** Attempt any **two** parts of the following : 10x2=20

- Write a program of binary search. Analyze its running time.
- What is tree data structure? Explain different ways to traverse a tree.

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**Q5.** Attempt any **two** questions from the following : 10x2=20

- What is the difference between an undirected graph and directed graph? Describe the different ways to implement graphs in computer memory.
- Define spanning tree of a graph. What is minimum spanning tree? Discuss any one method for finding the minimum spanning tree of a graph.
- Write short notes on the following :
  - Sparse matrices
  - Indexing of files

Time : 3 Hours] [Total Marks : 100

**Note :** Attempt the questions as indicated.

- Q1.** Attempt any **four** questions from the following : 5x4=20
- Consider the following C code segment :
- ```
int IsPrime(m)
{
    int i,m;
```
- Differentiate between iteration and recursion using suitable example.
 - Define algorithm. What are the criteria that every algorithm must satisfy? Write algorithm to find second largest value in the list.
 - What is a data type? Find the difference between primitive, non-primitive, abstract and polymorphic datatypes.

for(i = 2; i<= sqrt(m); i++)
 {
 int i,m;

[Contd...]

[JJ5]

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NHC202

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PAPER ID : 194402

Roll No. [

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Printed Pages : 6

NMCA213

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

PAPER ID : 214420

Roll No. [

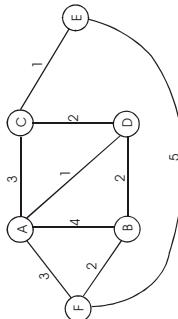
MCA-DUAL DEGREE**(SEM. II) THEORY EXAM. 2014-15****DATA STRUCTURES USING C****Printed Pages : 6**

NMCA213

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

PAPER ID : 214420

Roll No. [



- (c) What is spanning tree? Find the minimum cost of the following tree and draw its spanning tree

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NHC202

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

PAPER ID : 194402

Roll No. [

MCA**(SEM. II) THEORY EXAM. 2014-15****DATA STRUCTURES USING C****Printed Pages : 6**

NMCA213

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

PAPER ID : 214420

Roll No. [

Time : 3 Hours] [Total Marks : 100

Note : Attempt the questions as indicated.

- Q1.** Attempt any **four** questions from the following : 5x4=20
- Consider the following C code segment :
- ```
int IsPrime(m)
{
 int i,m;
```
- Differentiate between iteration and recursion using suitable example.
  - Define algorithm. What are the criteria that every algorithm must satisfy? Write algorithm to find second largest value in the list.
  - What is a data type? Find the difference between primitive, non-primitive, abstract and polymorphic datatypes.

[Contd..]

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[ JJ5 ]

6

1

- (c) What do you mean by circular queue? How is it different from a simple queue? Show how an element is deleted from a circular queue.
- (d) Write a C function to delete the  $k^{th}$  element from a linked list, where k is an integer.
- (e) Why is it more difficult to move backward than forward in a linked list?
- (f) What do you mean by doubly-linked list? Explain with an example.
- Q3.** Attempt any **two** questions from the following : 10x2=20
- (a) Define the terms binary tree, complete binary tree and threaded binary tree. Also give an example of each.
- (b) Name the three conditions under which sequential search of a list is preferable to binary search. Why was binary search implemented only for contiguous lists, not for linked lists?

**214220]      4      [Contd..]**

**214220]      3      [Contd..]**

**214220]      2      [Contd..]**

**214220]      5      [Contd..]**

- (d) Write a function in C to find the largest element in an array.
- (e) Translate the following infix expression into its equivalent postfix expression by showing all steps
- $$(A - B) / ((D + E) * F)$$

- (f) Define recursion. What is the complexity of the following recursive function? Int DoSomething (int n) {
- ```

    If (n <= 2)
        return 1;
    else
        return (DoSomething (floor(sqrt(n))) + n);
    }
}

```

Q2. Attempt any **four** questions from the following : 5x4=20

- (a) Describe the three types of structures used for storing strings.
- (b) Is it possible to implement a queue with the help of two stacks? Explain.

Time : 3 Hours

Total Marks : 100

Note :- Attempt questions from each sections as indicated.

SECTION-A

1. Attempt all parts : **(2x10=20)**
- (a) Define Recursion.
- (b) Define Data Structure with suitable example.
- (c) Define Pop and Push operation in Stack.
- (d) What do you mean by the degree of node and degree of the tree.
- (e) Differentiate between Strictly and Almost Complete Binary Tree.
- (f) Draw binary tree of the following expression :
- (i) $(A + B) * (c + d)$
 - (ii) $(A + B + C) * (D + E + F)$
- (g) Define B^+ Tree.
- (h) Write the worst case complexity of Binary search.
- (i) Explain the concept of Devide & Conquer.
- (j) Define Spanning Tree.

- (c) What is Hash function? Name three techniques often built into Hash functions. Name four advantages of a chained Hash table over open addressing.

Q5. Attempt any **two** questions from the following : 10x2=20

(a) How many comparison of keys are required to verify that a list of n entries is in order? When are simple sorting algorithms better than optimised ones? Explain.

(b) What is heap? How does heap sort work? Sort the following seven numbers into increasing order using heapsort.

$$12, 19, 33, 26, 29, 35, 22$$

Q2. Attempt any **four** questions from the following : 5x4=20

(c) Define a B tree. Construct a B tree of order 3 by inserting following keys in the order shown into an empty B tree.

$$M \ Q \ A \ N \ P \ W \ X \ T \ G \ E \ J$$

- (d) Write a function in C to find the largest element in an array.
- (e) Translate the following infix expression into its equivalent postfix expression by showing all steps
- $$(A - B) / ((D + E) * F)$$

- (f) Define recursion. What is the complexity of the following recursive function? Int DoSomething (int n) {
- ```

 If (n <= 2)
 return 1;
 else
 return (DoSomething (floor(sqrt(n))) + n);
 }
}

```

**Q2.** Attempt any **four** questions from the following : 5x4=20

(a) Describe the three types of structures used for storing strings.

(b) Is it possible to implement a queue with the help of two stacks? Explain.

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**CA204**

(Following Paper ID and Roll No. to be filled in your Answer Book)  
**PAPER ID : 214204** Roll No.

**MCA.**

### (SEM. II) THEORY EXAMINATION 2013-14 DATA STRUCTURES AND FILE HANDLING

Time : 3 Hours

Total Marks : 100

Note :- Attempt questions from each sections as indicated.

### SECTION-A

1. Attempt all parts : **(2x10=20)**
- (a) Define the terms binary tree, complete binary tree and threaded binary tree. Also give an example of each.
- (b) Name the three conditions under which sequential search of a list is preferable to binary search. Why was binary search implemented only for contiguous lists, not for linked lists?
- Q3.** Attempt any **two** questions from the following : 10x2=20
- (a) Define the terms binary tree, complete binary tree and threaded binary tree. Also give an example of each.
- (b) Name the three conditions under which sequential search of a list is preferable to binary search. Why was binary search implemented only for contiguous lists, not for linked lists?

- (c) What do you mean by circular queue? How is it different from a simple queue? Show how an element is deleted from a circular queue.

- (d) Write a C function to delete the  $k^{th}$  element from a linked list, where k is an integer.

- (e) Why is it more difficult to move backward than forward in a linked list?
- (f) What do you mean by doubly-linked list? Explain with an example.

**Q3.** Attempt any **two** questions from the following : 10x2=20

- (a) Define the terms binary tree, complete binary tree and threaded binary tree. Also give an example of each.

- (b) Name the three conditions under which sequential search of a list is preferable to binary search. Why was binary search implemented only for contiguous lists, not for linked lists?

### SECTION-B

2. Attempt any three parts of the following : (10×3=30)
- Write down both Iterative and Recursive version of Binary Search Algorithm. What is the time-complexity in both cases ?
  - Write a procedure SORT, which sorts a linked list without changing any values in information field of the nodes.
  - Write procedure of operations :
    - B-Tree Search
    - B-Tree Insert
  - Illustrate the execution of HEAP SORT on the array.  
 $A = \langle 6, 14, 3, 25, 2, 10, 20, 7, 6 \rangle$
  - Explain depth first search traversal algorithm of a graph.

### SECTION-C

Note : Attempt any five of the following : (10×5=50)

- Explain prims algorithm to find the minimum cost spanning tree of a weighted graph. Illustrate your algorithm with an example.
- Write a program in C which sorts a list of n items using insertion sort method. Illustrate your algorithm with an example.
- Write an algorithm to insert an item into a binary search tree.
- Write functions in C that will :
  - Find height of a linked binary tree.
  - Copy a linked binary tree.
- Write C function to implement queues in a linear array with two indices 'front' and 'rear', such that when rear reaches the end of the array, all the items are moved to the front of the array.

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MCA-213

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

PAPER ID : 7306

Roll No.

**M.C.A.**  
**(SEMESTER-II) THEORY EXAMINATION, 2011-12**  
**DATA STRUCTURES USING C**

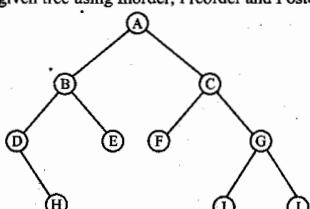
Time : 3 Hours

/ Total Marks : 100

Note : Answer all the Section as directed.

### Section - A

1. Attempt all the parts. 10 × 2 = 20
- What is data structure ? List out the areas where data structures are applied extensively.
  - Write the minimum number of queues needed to implement the priority queue.
  - Convert the expression  $((A + B) * C - (D - E) ^ (F + G))$  to equivalent prefix and postfix notations.
  - How many null branches are there in a binary tree with 20 nodes ?
  - Traverse the given tree using Inorder, Preorder and Postorder traversals.



- Explain the worst case time complexity of merge sort.
- Define a graph. How it differs from tree ?
- Define hashing.
- Define complete binary tree.
- Define circular linked list and its application.

- Explain B+ tree index files and B tree index files in detail.
- Write quick sort algorithm. Explain your algorithm taking suitable example. Analyze its running time.

### Section - B

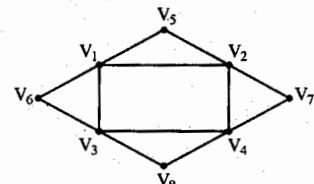
**3 × 10 = 30**

2. Attempt any three parts.

(a) Distinguish between the following :

- $(*m)[5]$  and  $*m[5]$
- $int(*ptr)$  and  $int *ptr()$

(b) Explain the representation of following graph by adjacency matrix and compare it with its linked-adjacency list representation.



- What is a circular queue ? Write the implementation of circular queues using arrays and also write the methods to perform insertion, deletion and display on it.
- What is meant by threaded binary tree ? Explain the impact of such a representation on the tree traversal procedure with suitable examples.
- What is sorting ? Sort the given values using Quick Sort and also explain all the intermediate steps required in sorting.

### Section - C

Attempt all questions.

**2 × 5 = 10**

3. Attempt two parts :

- What is stack ADT ? Construct stack ADT using dynamic memory allocation methods with following operations/checks methods on it.
  - insert an element
  - delete an element
  - empty stack
  - full stack

- (b) What is heap? How a Max/Min heap is created using array implementation with following methods :  
 (1) insert a node  
 (2) delete a node
- (c) Explain recursion. Write a recursive algorithm to calculate the factorial of a number. Also calculate the time complexity of this routine.

4. Attempt any two parts.  $2 \times 5 = 10$

- (a) Write a program in C using dynamic variables and pointers to simply construct a singly linked list consisting of following information.

- (i) Student id
- (ii) Student name
- (iii) Semester

The operations to be supported are

- (1) Adding a new student.
- (2) Searching a student based on student id & updates the information content. If the specified node is not present in the list an error message should be displayed.
- (b) Show how a polynomial can be represented using a linked list. Write an algorithm to add two polynomials containing minimum of four terms.
- (c) Explain various garbage collection and compacting techniques.

5. Attempt any two parts.  $2 \times 5 = 10$

- (a) Construct the binary tree given the following traversals :

Pre-order : A B D G H C E I F

In-order : G D H B A E I C F

- (b) Show how to represent a binary tree by using linked list representation. Write methods to insert and delete an item in the tree.
- (c) How a tree is copied into another tree? Explain the procedure with an example.

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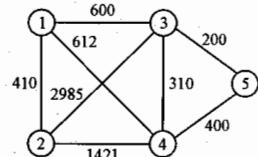
6. Attempt any two parts :

$2 \times 5 = 10$

- (a) What are the types of Collision Resolution Techniques and the methods used in each of the type? Explain with suitable example.
- (b) What is AVL tree? Explain all the unbalanced cases of AVL trees with examples showing balance factors of its nodes.
- (c) What is B-Tree? Define the B-tree of order 3 created by inserting the following data arriving in sequence - 92, 24, 6, 7, 11, 8, 22, 4, 5, 16, 19, 20, 78

7. Attempt any one part.  $1 \times 10 = 10$

- (a) What is minimum spanning tree? What are the methods to get a MST from the graph? Convert the given graph with weighted edges to minimal spanning tree.



- (b) (i) What is file organization. And explain the data structure required for it.
- (ii) Explain indexing. What are primary indices and secondary indices? Explain with suitable examples.

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MCA-213

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

PAPER ID : 7306 Roll No.

### M. C. A. (Second Semester) Theory Examination, 2010-11

#### DATA STRUCTURE USING C

Time : 3 Hours]

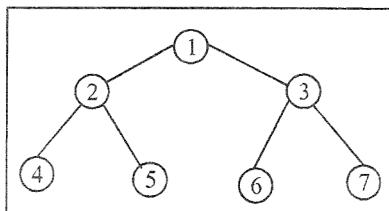
[Total Marks : 100

Note: This question paper contains three Sections. Selecting-A, Section-B and Section-C with the weightage of 20, 30 and 50 marks respectively. Follow the instructions as given in each Section.

#### Section-A

This question contains 10 questions of multiple choice, True/False and Fill in the blanks. Attempt all parts of this Section.  $2 \times 10 = 20$

1. (a) Consider the following tree :



If the post order traversal gives 1, 2, 3, ..... then the label of the nodes 1, 2, 3, ..... will be :

- (i) +, -, \*, a, b, c, d
- (ii) a, -, b, +, c, \*, d
- (iii) a, b, c, d, -, +, \*
- (iv) -, a, b, +, \*, c, d .

- (b) The number of swapping needed to sort the numbers 8, 22, 7, 9, 31, 19, 5, 13 in ascending order using bubble sort will be :

- (i) 11
- (ii) 12
- (iii) 13
- (iv) 14.

- (c) The depth of a complete binary node with  $n$  nodes will be :

- (i)  $\log_2(n+1)-1$
- (ii)  $\log_2(n)$
- (iii)  $\log_2(n-1)+1$
- (iv)  $\log_2(n)+1$ .

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- (d) The average successful search time for sequential search on  $n$  items is :
- $n/2$
  - $(n-1)/2$
  - $(n+1)/2$
  - $\log(n)+1$ .
- (e) There are four different algorithms  $A1, A2, A3, A4$  to solve the given problem with the order  $\log(n), \log(\log(n)), n \log(n), n/\log(n)$ . Which is the best algorithm ?
- $A1$
  - $A2$
  - $A3$
  - $A4$ .
- (f) The way a card game player arranges his card as he picks them up one by one, is an example of :
- Selection sort
  - Insertion sort
  - Merge sort
  - Bubble sort.

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- (b) Define algorithm. What are the criteria that every algorithm must satisfy ? Write an algorithm to find the second largest from the list of given integers.
- (c) (i) How two-dimensional arrays are stored in one dimensional memory ?  
(ii) If an array is defined as  $a[10][20]$  in C. Device a formula to calculate the address of any variable say  $a[i][j]$ , for any valid value of  $i$  and  $j$ .
- (d) What is hash table ? How using hash table is beneficial for us ? Explain collision resolution strategies used in hash table.
- (e) Write an algorithm for quick sort. Trace your algorithm on the following data to sort the list :

12, 5, 14, 2, 56, 7, 85, 51, 18, 1, 75, 42, 1, 9.

#### Section-C

Attempt any two parts from each question. All questions carry equal marks.  $10 \times 5 = 50$

3. (a) What is a sparse matrix ? How sparse matrices can be represented efficiently in memory ?

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- (g) Select odd man out.
- Depth first search
  - Prims' algorithm
  - Adjacency Matrix
  - In order traversal.
- (h) Polynomial representation can be done using :
- Structure
  - Linked List
  - Tree
  - Graph.
- (i) In every case time complexity is given priority to space complexity in designing algorithm. (True/False)
- (j) Priority queue can be implemented using .....

#### Section B

Attempt any three questions. All questions carry equal marks.  $10 \times 3 = 30$

2. (a) Differentiate between iteration and recursion giving suitable example. Recursion takes more execution time when compared to iteration ? Give reason.

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- (b) What is a Data Type ? Differentiate between primitive data type, abstract data type, and polymorphic data type.
- (c) Convert the given infix expression to equivalent postfix notation :  
 $a + b / (c - d) + exg - h$ .
4. (a) Write an algorithm for adding and deleting in circular queue.
- (b) Write a program in C to delete a specific element in a single linked list.
- (c) Doubly linked list takes more space than singly linked list for storing one extra address. In what condition could be a doubly linked list be more beneficial than singly linked list ?
5. (a) What is tree data structure ? Explain the different ways of traversing a tree.
- (b) Explain the significance of threaded binary tree.
- (c) Write a program in C for binary search. Analyze its running time.
6. (a) Perform Heap sort on the following list of integers :  
23, 5, 47, 58, 4, 52, 15, 48, 26, 3, 11, 4, 7.

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- (b) Explain the procedure of insertion and deletion in Binary search tree.
- (c) Define AVL tree. Explain the different types of rotation done in AVL tree.
7. (a) What are the different ways in which the graph is represented in computer memory ?
- (b) What is Minimal Spanning Tree ? Write an algorithm to find the MST.
- (c) Write short notes on any two of the following :
- (i) Sequential Files
  - (ii) Indexing
  - (iii) B+ Tree Index Files.

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|--------------------------------------------------------------------|--|--|--|--|-----------------------|--|--|--|--|
| (Following Paper ID and Roll No. to be filled in your Answer Book) |  |  |  |  |                       |  |  |  |  |
| <b>PAPER ID : 7306</b>                                             |  |  |  |  | <b>Roll No. _____</b> |  |  |  |  |

M.C.A.

(SEM II) EVEN SEMESTER THEORY EXAMINATION, 2009-2010

**DATA STRUCTURES USING C**

Time : 3 Hours

Total Marks : 100

Note : (i) This paper is in three sections. Section-A carries 20 marks, Section-B carries 30 marks and Section-C carries 50 marks.

- (ii) Attempt all questions. Marks are indicated against each questions/parts.
- (iii) Assume data where required.

**SECTION - A**

1. You are required to answer all the parts of this question. (10x2=20)  
Choose the correct answer for parts (a) to (d) :
- (a) The complexity of Binary Search is given by :
    - (i)  $\log_2 n$
    - (ii)  $\log_2 2$
    - (iii)  $n \log_2 n$
    - (iv) none of the above
  - (b) A linear list in which the elements can be added or removed at either end but not in the middle, is called :
    - (i) Queue
    - (ii) Circular queue
    - (iii) Priority queue
    - (iv) Deque
  - (c)  $O(n \log n)$  is the worst-case complexity for :
    - (i) Quick sort
    - (ii) Bubble sort
    - (iii) Merge sort
    - (iv) None of the above

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[Turn Over]

- (d) In a complete binary tree of depth d, the number of leaf nodes is :

- (i)  $2^d - 1$
- (ii)  $2^d$
- (iii)  $2^d + 1$
- (iv)  $2^{d+1} - 1$

State TRUE or FALSE for the parts (e) to (g).

- (e) In stack insertions and deletion can take place only at one end.
- (f) The binary tree is also called B-tree.
- (g) A graph with one cycle is also called a tree.

Fill in the BLANKS for parts (h) to (j).

- (h) The binary search is used to find an element from a given \_\_\_\_\_ list.
- (i) \_\_\_\_\_ Traversal of Binary search tree gives sorted sequence.
- (j) Warshall's algorithm is used to find \_\_\_\_\_.

**SECTION - B**

2. Attempt any three parts of the following : (3x10=30)

- (a) Define stack with suitable example. Implement a stack in C in which each item on the stack is a varying number of integers. Choose a C data structure for such a stack and design *push* and *pop* functions for it.
- (b) Write an algorithm and a function addint (*p, q*) in C to add two long positive integers represented by singly linked circular lists.
- (c) Explain B+ trees giving some of its applications. Also explain the algorithm to add and delete an element to B+ tree with suitable example.
- (d) Describe various representations of graph.
- (e) Write short notes on the following :
- (i) Preorder traversal of tree.
  - (ii) Removal of recursion.

**SECTION - C**

3. Attempt any two parts of the following : (2x5=10)
- (a) What do you mean by Binary Search Tree (BST) ? Discuss the insertion and deletion algorithm for BST with suitable example.
  - (b) Describe the evaluation of postfix notation using stack with example giving the algorithm for the same.
  - (c) Write a program in C to create a database of student of your class using structure. Make suitable assumptions yourself.
4. Attempt any two parts of the following : (2x5=10)
- (a) Give the practical consideration for internal sorting. Also write a program in C to sort the given array of positive integers using bubble sort.
  - (b) Given an integer *k*, write a function in C programming language, which deletes the *k*th element from a two-way circular header list. Make suitable assumption yourself.
  - (c) Discuss the following :
    - (i) Hash function and Hash table implementation.
    - (ii) Priority Queues
5. Attempt any two parts of the following . (2x5=10)
- (a) Define multi-way search tree. Also write an algorithm to delete a record from a top-down multi-way search tree of order *n*.
  - (b) Write an algorithm for a routine *merge* (*x, ll1, ub1, ub2*) that assumes that *x[ll1]* through *x[ub1]*, and *x[ub1 + 1]* through *x[ub2]* are sorted and merges the two into *x[ll1]* through *x[ub2]*.
  - (c) Explain the various steps of Quick sort algorithm with suitable example of at least 10 elements.

6. Attempt any two parts of the following : (2x5=10)
- What do you mean by file organization ? Describe various file organization with examples.
  - Develop an algorithm using a heap of k elements to find the largest k numbers in a large, unsorted file of n numbers.
  - Write a short note on Huffman algorithm explaining various steps with example.
7. Write short notes on any four of the following : (4x2.5=10)
- Spanning tree.
  - Adjacency matrices
  - Pointer arithmetic in C
  - AVL trees.
  - Algorithm complexity.
  - Overflow and underflow in linked lists.

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**MCA - INTEGRATED  
(SEM IV) THEORY EXAMINATION 2018-19  
DATA STRUCTURE USING C**

Time: 3 Hours

Total Marks: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

1. Attempt all questions in brief. 2 x 7 = 14
- Define the term 'Algorithm'. Give the essential properties of an algorithm.
  - Define the types of queues.
  - Discuss Linear and Nonlinear data structure with example.
  - Explain parameter-passing technique used in C with example.
  - Define Threaded Binary Tree with suitable example.
  - Discuss the basic Data Structure operations.
  - Define the properties of Binary Search Tree.

**SECTION B**

2. Attempt any three of the following: 7 x 3 = 21
- What is Queue? Explain Priority Queue. Write uses of Queue.
  - Drive the index formula for 2-Dimention array stored as row major order.
  - Transform the following prefix expression to infix:  
++A-\*SBCD/+EF\*GHI.
  - What do you mean by pattern matching? Discuss any pattern matching algorithm with proper example.
  - Write an algorithm which finds the transitive closure of a graph.

**SECTION C**

3. Attempt any one part of the following: 7 x 1 = 7
- Define the term data structure? List some linear and non-linear data structure stating the application area where they will be used.
  - Write function in C, which deletes all occurrence of given character from a given string.
4. Attempt any one part of the following: 7 x 1 = 7
- How two-dimensional array are represented in memory? Also obtain the formula for calculating the address of any element stored in array, in case of column major order. (Make necessary assumptions yourself)
  - Write a "C" program-using stack to check whether a string is palindrome or not. Do not define empty, push, and pop functions. (Note: Palindrome is a sequence of characters that read the same as backward and forward.)

5. Attempt any one part of the following: 7 x 1 = 7
- Let A[n] be an array of "n" numbers. Design a data structure and algorithm to perform any sequence of the following two operations: -
    - Add (i,y) : add the value y to the  $i^{\text{th}}$  number in the array.
    - Partial-sum(i): returns the sum of the first " $i^{\text{th}}$ " numbers in the array i.e.  

$$\sum_{j=1}^i A[j].$$
  - Write an algorithm for insertion and deletion of elements of a queue. Use a Boolean variable to distinguish between a queue being empty or full
6. Attempt any one part of the following: 7 x 1 = 7
- Use Quick sort algorithm to sort 36, 15, 40, 1, 60, 20, 55, 25, 50, and 20. Is it a stable sorting algorithm? Justify.
  - Illustrate the creating of AVL trees of 7 nodes with key values 1, 2, 3, 4, 5, 6, 7.
7. Attempt any one part of the following: 7 x 1 = 7
- Differentiate Sequential file organization and Direct file organization.
  - Define Hashing. Discuss various methods of collision resolution with suitable example.

**MCA(LATERAL)  
(SEM IV) THEORY EXAMINATION 2018-19  
FUNDAMENTAL OF DATA STRUCTURE, NUMERICAL AND COMPUTATIONAL THEORY**

Time: 3 Hours

Total Marks: 70

Note: Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

1. Attempt all questions in brief. 2 x 7 = 14
- What is regular expression?
  - What is difference between Array and queue?
  - Which sorting method is slowest? Why?
  - What is the difference between curve fitting and interpolation?
  - What is regression?
  - Which language is accepted by finite automata?
  - Why NFA is more powerful than DFA?

**SECTION B**

2. Attempt any three of the following: 7 x 3 = 21
- What is a linked list in data structures? How is linked list implemented?
  - Which of the sorting algorithms can be used to sort a random linked list with minimum time complexity? Discuss it with an example.
  - What is the difference between linear regression and multiple regression? Explain it with an example.
  - Design a NFA for the regular expression  $(a+b)^*ab$
  - Discuss the closure properties of context free languages.

**SECTION C**

3. Attempt any one part of the following: 7 x 1 = 7
- What is a data structure? What are linear and nonlinear data structures?
  - Define insertion sort. Sort the sequence 8, 1, 4, 1, 5, 9, 2, 6, 5 by using insertion sort.
4. Attempt any one part of the following: 7 x 1 = 7
- How are linked lists better than arrays? What are the advantage of linked list over array?
  - If the regression coefficients are 0.12 and 0.3, What would be the value of coefficients of correlation?
5. Attempt any one part of the following: 7 x 1 = 7
- Find the straight line that best fits the following data using least squares method:
- |   |   |   |   |   |   |
|---|---|---|---|---|---|
| X | 1 | 2 | 3 | 4 | 5 |
| Y | 2 | 5 | 3 | 8 | 7 |
- Write short notes on:
    - T - test
    - F - test
6. Attempt any one part of the following: 7 x 1 = 7
- Show that  $L = \{a^p / p \text{ is prime number}\}$
  - Define a Turing machine. Describe it using ID with an example.

7. Attempt any one part of the following:  $7 \times 1 = 7$
- Define Push down automata (PDA) using diagram? Construct a PDA for the language  $L = \{a^n, b^{2n} / n \geq 1\}$ .
  - Write short notes on:
    - Ambiguous grammar
    - Normal forms of grammar.

MCA  
(SEM - IV) THEORY EXAMINATION 2017-18  
Fundamental of Data Structure, Numerical and Computational Theory

Time: 3 Hours

Total Marks: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

## SECTION A

1. Attempt all questions in brief.  $2 \times 7 = 14$
- What are arrays? Explain the types with suitable example?
  - Define the Insertion Sort and Bubble Sort with its complexity analysis?
  - What is Binary Search Tree? How Insertion and Deletion performed in BST?
  - Define Curve Fitting? Explain principle of Least Squares?
  - How do you find the complexity of an algorithm?
  - Define a NFA and compute its language?
  - What are regular expressions and why they are used?

## SECTION B

2. Attempt any three of the following:  $7 \times 3 = 21$
- What are Linked Lists? How insertion and Deletion performed in Linked Lists, Explain?
  - By the method of least squares, find the straight line that best fits the following data:  

|    |   |     |     |     |     |
|----|---|-----|-----|-----|-----|
| x: | 0 | 1   | 2   | 3   | 4   |
| y: | 1 | 1.8 | 3.3 | 4.5 | 6.3 |
  - Define: (1) Chomsky Hierarchy and (2) Turing Machine Model?
  - Explain any two of the following in detail:  
    - Lexical phase errors
    - Syntactic phase errors
    - Semantic phase errors.
  - Discuss the algorithms for constructing a NFA from a regular expression and then converting it to the corresponding DFA?

## SECTION C

3. Attempt any one part of the following:  $7 \times 1 = 7$
- What is data structure? List out the areas where data structures are applied extensively?
  - Define: Two Way Merge Sort and Two-Way Header List?
4. Attempt any one part of the following:  $7 \times 1 = 7$
- Define Heap Sort with the complexity analysis? Compare Merge Sort and Heap Sort?
  - What is a data type? Find the difference between primitive, Non-primitive, abstract and polymorphic data types.

5. Attempt any one part of the following:  $7 \times 1 = 7$
- What are regressions? Explain Linear and Non-Linear Regressions?
  - Write an algorithm for fitting a straight line of the form  $y = a + bx$  for a given set of data points?
6. Attempt any one part of the following:  $7 \times 1 = 7$
- Define: Chi-square test, t-test and F-Test with its applications?
  - What are forecasting models and why these models are used?
7. Attempt any one part of the following:  $7 \times 1 = 7$
- Eliminate left recursion and left factor the following grammar.  
 $E \rightarrow abab | abba | Eb | EBE$
  - Draw NFA for the regular expression  $ab^*/ab$ ?