

AMIETE – CS/IT {NEW SCHEME}

Time: 3 Hours

JUNE 2014

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. A mathematical-model with a collection of operations defined on that model is called

- (A) Data Structure (B) Abstract Data Type
(C) Primitive Data Type (D) Algorithm

b. The number of nodes in a full binary tree having K leaves are:

- (A) K nodes (B) $\log 2K$ nodes
(C) $2K - 1$ node (D) $2K + 1$ nodes

c. The design technique exploited by quick sort algorithm is

- (A) Greedy (B) Dynamic programming
(C) Divide and Conquer (D) Backtracking

d. The maximum degree of any vertex in a simple graph with p vertices is

- (A) $p-1$ (B) $p+1$
(C) $2p-1$ (D) p

e. In which order the array has been sorted, If the address of A[1][1] and A[2][1] are 1000 and 1010 respectively and each element occupies 2 bytes.

- (A) row major (B) column major
(C) matrix major (D) none of these

- f. Which characteristic of the data is used by binary search but the ignored by linear search, that is the:
- (A) Order of the elements of the list (B) Length of the list
(C) Maximum value in list (D) Type of elements of the list
- g. The extra key inserted at the end of the array is known as:
- (A) End key (B) Stop key
(C) Sentinel (D) Transposition
- h. An ADT is defined to be a mathematical model of a user-defined type along with the collection of all _____ operations on that model.
- (A) Cardinality (B) Assignment
(C) Primitive (D) Structured
- i. The largest element of an array index is called its
- (A) Lower bound (B) Range
(C) Upper bound (D) Order
- j. What is the worst case time complexity of Bubble sort? If we consider that n elements are to be sorted.
- (A) $O(1)$ (B) $O(\log 2n)$
(C) $O(n)$ (D) $O(n^2)$

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

- Q.2** a. Explain the following terms: Data Type, Abstract Data Type, and Primitive Data Structures. (6)
- b. Define an algorithm. Describe commonly used asymptotic notations and give their significance. (2+4)
- c. Consider a 2-D array named GROUP [5] [7] is stored in row major order with base address 123. What is the address of GROUP [2] [3]? (4)
- Q.3** a. Define stack. Show the steps to convert the following infix expression to postfix form using stack.

$$A + (B * C - (D / E \wedge F) * E) * H$$
 (2+6)
- b. Consider the following sequentially implemented double ended queue of characters which is allocated 5 characters with Front = 1 and Rear = 2.

DQueue

	B	C		
--	---	---	--	--

 F=1, R=2

Now, perform the following operations on the deque

- (i) Add D from the front end.
- (ii) Add E from the rear end.
- (iii) Delete E from the rear end.
- (iv) Delete D from the front end. (2×4)

Q.4 a. Distinguish between singly and doubly linked list using an example. Show a schematic diagram that represents the scenario of a linked list of two elements and a new element which has to be inserted between them. (4+4)

b. Write an algorithm to count the number of nodes in the circular linked list. (4)

c. Write a program in C / C++ to implement queue using single linked list. (4)

Q.5 a. Write the short notes on the following trees:

- (i) Full binary tree
- (ii) Binary search Tree
- (iii) Threaded binary tree (6)

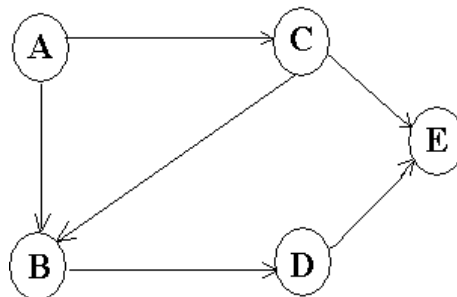
b. Explain Expression Tree. Draw the expression tree for the expression:
 $(p + (q * r)) + (((s * t) + u) * v)$ (2+4)

c. Discuss that how to convert a general tree to a Binary Tree. (4)

Q.6 a. Define a graph. What are the standard ways in which a graph can be traversed? (2+4)

b. Write the Prim's algorithm for finding the minimum-spanning tree of a graph. (6)

c. Draw the adjacency matrix and the adjacency list representation for the directed graph given below. (4)



Q.7 a. What do you mean by hashing? Describe any two commonly used hash functions. (8)

- b. Write an algorithm in C / C++ for Binary Search technique. Use the algorithm to search 20 in the following list of elements. Explain the process.
12, 16, 17, 19, 20, 22, 24, 29, 30, 32, 37 (4+4)
- Q.8** a. Write an algorithm in C / C++ for quick sort. Sort the following sequence of numbers using quick sort method.
26, 58, 49, 37, 11, 91, 83, 32 (5+5)
- b. Explain the radix sort with its algorithm. What is the time complexity of radix sort? (4+2)
- Q.9** a. Write a program to copy the contents of one file into another file using command line arguments. (8)
- b. Discuss the various methods for storing sequential files? Also write a program that creates random numbers in a given file. (8)