

DiplETE – CS (OLD SCHEME)

Code: DC08
Time: 3 Hours

DECEMBER 2010

Subject: DATA STRUCTURE
Max. Marks: 100

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 half an hour 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 linear collection of data elements where the linear node is given by means of pointer is called
- (A) linked list (B) node list
(C) primitive list (D) none of these
- b. Adjacency matrix for a digraph is
- (A) unit matrix (B) asymmetric matrix
(C) sym matrix (D) none of these
- c. Out of the following _____ sort method is optimum in the worst case?
- (A) Selection sort (B) Quick sort
(C) Merge sort (D) None of these
- d. In linked list representation, a node contains at least
- (A) node address field, data field
(B) node number, data field
(C) next address field, information field
(D) none of above
- e. A minimal spanning tree of a graph with n nodes will have _____ nodes
- (A) n-1 (B) n
(C) n^2 (D) n+1
- f. Number of nodes in a complete binary tree of depth k is
- (A) 2^k-1 (B) 2k
(C) 2^k (D) 2^{k+1}

- g. Which of the following is a hash function?
- (A) Quadratic probing
 - (B) Chaining
 - (C) Open addressing
 - (D) Folding
- h. Sparse matrices have
- (A) many zeroes entries
 - (B) many non numeric entries
 - (C) higher dimension
 - (D) none of these
- i. A complete full binary tree with 10 leaves
- (A) cannot have more than 19 nodes
 - (B) has exactly 19 nodes
 - (C) has exactly 17 nodes
 - (D) cannot have more than 17 nodes
- j. What is the postfix form for $A-B * C+D$
- (A) $ABC * - +D$
 - (B) $ABC - * D+$
 - (C) $ABC * - D +$
 - (D) $ABC * - +$

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

- Q.2** a. Which function grows faster?
 \sqrt{n} or $\log n$? (4)
Prove your claim.
- b. If $p(x) = C_m x^m + \dots + C_2 x^2 + C_1 x + C_0$ is a polynomial of degree m
than show that $p(x) = O(x^m)$. (4)
- c. Write a “C” function to multiply two polynomials and to return the
product. Analyze the time complexity. (8)
- Q.3** a. Describe an algorithm that deletes an item from the specified position in
the linked list. (8)
- b. Write “C” function to add two sparse matrices, where sparse matrices are
to be represented by linked list. (8)
- Q.4** a. Write a “C” function for the “add” and “delete” operations on a queue
which is represented by a linked list. (8)

- b. Convert the following infix expression into postfix expression using stack
 $Q = (A + (B * C - (D / E \uparrow F) * G) * H).$ (8)
- Q.5** a. Write a “C” function to implement binary search and compute its time complexity (8)
- b. Write a “C” functions to merge sort a list of numbers in a bottom-up manner when the list is represented by a linked list using pointers. (8)
- Q.6** a. Write down the algorithm of bubble sort. Sort the following elements using bubble sort (11, 15, 2, 13, 6) (8)
- b. Explain hashing. Describe any two commonly used hash functions. (8)
- Q.7** a. Write a non recursive algorithm to traverse a binary tree in preorder. (8)
- b. Explain the properties of a binary tree. (8)
- Q.8** a. Write a “C” function to insert a new key to a B-tree of order “m” (8)
- b. Define the following in relation to graph (8)
- (i) Directed graph
 - (ii) Weighted graph
 - (iii) Spanning tree
 - (iv) Path
- Q.9** a. Write a “C” function of Dijkstra’s shortest path algorithm (8)
- b. Describe Breadth First Search algorithm. (8)