

DiplETE – CS (NEW SCHEME) – Code: DC54**Subject: DATA STRUCTURES**

Time: 3 Hours

DECEMBER 2011

Max. Marks: 100

NOTE: There are 9 Questions in all.

- Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.
- 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. When a variable is declared as _____, memory is allocated to the variable when function is called and deallocated once the function completes its execution.

- (A) Static (B) Register
(C) Automatic (D) Both (A) and (B)

b. The time complexity of heap sort of an array having n elements is

- (A) $O(\log_2(n))$ (B) $O(2n \log_2(n))$
(C) $O(n * n \log_2(n))$ (D) $O(n \log_2(n))$

c. Priority _____ is maintained by the scheduler of an operating system.

- (A) Queue (B) Stack
(C) Linked List (D) Array

d. Minimum number of pointers used by a node in a doubly linked list is:

- (A) 4 (B) 3
(C) 1 (D) 2

e. The data type used in file pointer is _____.

- (A) File (B) FILE
(C) PTRFILE (D) FILEPTR

f. Adjacency matrix and adjacency lists are used to represent _____ data structure.

- (A) Linked List (B) Queue

- g. _____ sort requires an additional list of size n .
- (A) Bubble (B) Merge
(C) Heap (D) Quick
- h. The link field of a node in a singly linked list contains the address of _____ node
- (A) Next (B) Start
(C) Last (D) NULL
- i. The maximum number of nodes in a binary search tree at level i where $i \geq 1$ is given as
- (A) 2^{i+1} (B) 2^i
(C) 2^{i-1} (D) 2^{i+1}
- j. The maximum number of edges in an undirected simple graph with n vertices is given as
- (A) $n(n-2)/2$ (B) $n(n-1)/2$
(C) $n(n+2)/2$ (D) $n(n+1)/2$

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

- Q.2** a. Explain the scope of following variables. Also explain how storage allocation is done for these
- (i) External variables
(ii) Register variable
(iii) Static variables (6)
- b. Explain the working of recursive functions. Write a program to implement a recursive function. (6)
- c. Compare static memory allocation and dynamic memory allocation. Give their respective applications. (4)
- Q.3** a. Create a structure named Employee with fields as name, designation and salary. Declare structure variable, structure array and structure pointer. Write a program to input values and display values for each of the above declarations. (7)
- b. Write a program to read the contents of a data file, a.dat. Sort the data values and write the modified values to a new file, b.dat. (7)
- c. Define Unions and compare it with structures. (2)
- Q.4** a. Write a program to implement quick sort technique. Discuss best and worst case of quick sort. (7)

c. Discuss briefly binary search algorithm .Give an example to illustrate the algorithm.

- Q.5**
- a. Give various technical applications of stacks and queues. (4)
 - b. Write a program to implement the following data structures with necessary basic functions:
 - (i) Stacks (ii) Queues (8)
 - c. How can queue structure be modified to work as stack? Give its representation and an illustration. (4)

- Q.6**
- a. Consider a linked list having integer elements. Write a program to split the linked list into two linked list, where the first linked list has even numbers and the second linked list has odd numbers. (6)
 - b. Explain how a polynomial can be represented using linked list. (5)
 - c. If a linked list is very long, then the time complexity increases. Suggest a solution to minimize the complexity of linear linked list. (Note: The structure of linked list should not be changed). (5)

- Q.7**
- a. Compare the performance of Breadth First Search and Depth First Search traversal algorithms. (6)
 - b. Define in-degree and out-degree for a directed graph. Give an illustration to find out in-degree and out-degree of each node (4)
 - c. Find the minimum cost spanning tree for the following graph (Fig.1). Show sequence of steps involved. (6)

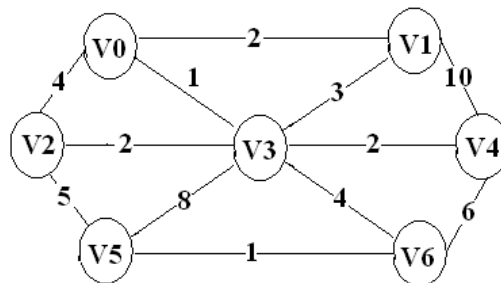


Fig. 1

- Q.8**
- a. Write a program to insert an element into a doubly linked list at the following positions:
 - (i) Start
 - (ii) End
 - (iii) After a specified node position (9)
 - b. What are limitations of linear linked list over circular linked list? (2)
 - c. Compare the performance of singly and doubly linked lists. Give various applications of doubly linked list (5)

- Q.9** a. Find the preorder, inorder and postorder traversals of the following binary tree (Fig.2)

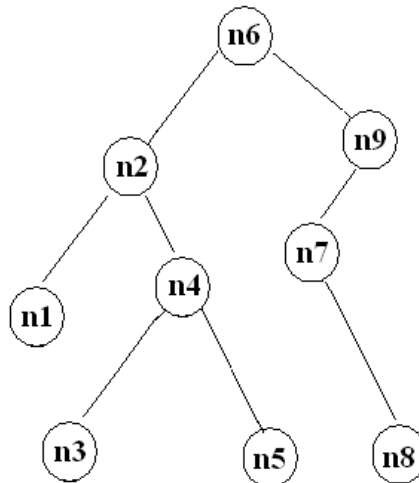


Fig.2

- b. Write a program to search an element k in a binary search tree. (6)
- c. Compare the performance of non-linear and linear data structures. Illustrate by using suitable example. (4)