

**Third Semester B. E. (Computer Science and Engineering)
Examination**

DATA STRUCTURES AND PROGRAM DESIGN

Time : 3 Hours]

[Max. Marks : 60

Instructions to Candidates :—

- (1) Attempt all questions.
- (2) All questions carry marks as indicated against them.
- (3) Due credit will be given to neatness and adequate dimensions.
- (4) Assume suitable data and illustrate answers with neat sketches wherever necessary.

1. Solve any One :—

- (a) Write a C function to convert an infix expression into prefix expression. Apply your algorithm on following expression - $A \uparrow B^*C - D + E / F / (G + H)$

Explain the process for evaluating a postfix expression. For the postfix expression : $6\ 2\ 3\ +\ -\ 3\ 8\ 2\ /\ +\ *\ 2\ \uparrow\ 3\ +\ ;$ show the stack frame at each stage of evaluation. 10 (CO 1)

- (b) A double-ended queue (de-queue) is a linear list where additions and deletions can be performed at either end. Represent a deque using an array to store the elements of the list and write "C" functions to perform addition and deletion operations. 10 (CO 1)

2. Solve any One :—

- (a) Write a program to create a singly linked list with and without cycles. Devise a function to detect a cycle in a Linked List, and if cycle is present then removes the cycle. 10 (CO 1)
- (b) Write a C function using dynamic variable and pointers to construct singly linked list consist of following information : student Id, Student Name, Semester. The operation to be performed is delete a node based on student ID. If the specified node is not present it should display an error message. Demonstrate both the options. 10 (CO 1)

3. Solve any **Two** :—

- (a) Consider the algebraic expression $E = (2x + y) (5a - b)^2$. Draw the Tree T which corresponds to expression E. Also find the prefix expression using T. 5 (CO 2)
- (b) Construct Binary Search tree for the following - 100, 50, 200, 25, 90, 80, 150, 300, 180. Write a C function to delete a node from a given binary search tree. 5 (CO 2)
- (c) Draw an AVL tree whose elements are inserted in the following order {3, 5, 11, 8, 4, 1, 12, 7, 2, 6, 10}. Give characteristics of good balance condition in a tree. 5 (CO 2)

4. Solve any **One** :—

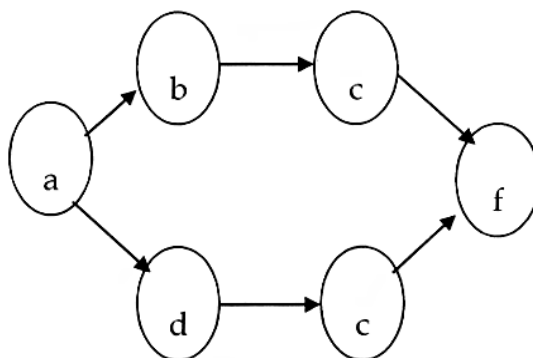
- (a) Write a function to create a hash table of N buckets chaining with singly linked list. Show the relevant operations as deletion, searching and display using dynamic list and design a hash index based on key value voter id to display following result :

Adhar No	Pan No	Voter ID	Name	Age	10 (CO 3)
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- (b) Explain various collision resolving techniques encountered in open hashing. Write an algorithm to build a hash table using separate chaining scheme. 10 (CO 3)

5. Solve any **Two** :—

- (a) Implement Kruskal's algorithm using C. Assume suitable information and represent the graph accordingly. 5 (CO 2, CO 4)
- (b) Find the number of different topological ordering of the vertices of the graph and specify the list.



5 (CO 2, CO 4)

- (c) Write a C function that uses a breadth first traversal to determine if a directed graph is cyclic. 5 (CO 2, CO 4)

6. Solve any **Two** :—

- (a) Solve the following : construct a max heap with the key 21, 6, 56, 61, 44, 7, 9, 76, 75, 32. Write a C function to implement the same. 5 (CO 4)
- (b) How does a bucket sort differ from the comparison based sort ? Implement the bucket sort on the list $B[] = \{90, 80, 70, 50, 40, 30\}$ 5 (CO 4)
- (c) Describe the process of merge sort with the given list of element : 80, 75, 45, 90, 30, 40, 12, 15, 93, 8, 50, 10 5 (CO 4)