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B.Tech (CSE / CSE(AIML) / CSE(IOT-CYS-BCT)

Semester: 3rd

Paper Name: Data Structure & Algorithm Laboratory

Paper Code: PCC - CS391

Assignment List

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Semester: 3rd

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ASSIGMENT NO.- I

(Revision of Array & Loop)

(All programs to be implemented in both C & Python Programming Language)

Print the following Pattern:

1.
```
*
# *
# * #
* # * #
* # * # *
```

2.
```
        A
      B   B
    C  C  C
  D  D  D  D
```

3.
```
        1
      2   3
    4   5   6
  7   8   9   10
```

4. Consider the given series and calculate the summation up-to 'N' number.
1+1+4+9+25+64+……..+N

5. Write a program to insert a new element in array at given location k.
6. Write a program to delete an element from array.
7. Write a program to remove duplicate elements from array.
8. Write a program to find second highest from an array. (Do not use sorting)
9. Write a program to find frequency of a given number 'k'.
10. Write a program to merge two sorted array of length M & N. [M & N may not be equal]

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ASSIGMENT NO.- II

(List, Tuples, Set, Dictionary)

(All programs to be implemented in Python Programming Language)

List:

1. Reverse a list in Python
2. Concatenate two lists index-wise.
3. Turn every item of a list into its square.
4. Concatenate two lists in the following order.
5. Iterate both lists simultaneously.
6. Remove empty strings from the list of strings.
7. Add new item to list after a specified item.
8. Extend nested list by adding the sublist.
9. Replace list's item with new value if found
10. Remove all occurrences of a specific item from a list.

Tuples:

1. Reverse the tuple.
2. Access value 20 from the tuple.
3. Create a tuple with single item 10.
4. Unpack the tuple into 4 variables.
5. Swap two tuples in Python.
6. Copy specific elements from one tuple to a new tuple.
7. Modify the tuple.
8. Sort a tuple of tuples by 2nd item.
9. Counts the number of occurrences of item 'x' from a tuple.
10. Check if all items in the tuple are the same.

Set:

1. Add a list of elements to a set.
2. Return a new set of identical items from two sets.
3. Get Only unique items from two sets.
4. Update the first set with items that don't exist in the second set.
5. Remove items from the set at once.
6. Return a set of elements present in Set A or B, but not both.
7. Check if two sets have any elements in common. If yes, display the common elements.
8. Update set1 by adding items from set2, except common items.
9. Remove items from set1 that are not common to both set1 and set2.

Dictionary:

1. Convert two lists into a dictionary.
2. Merge two Python dictionaries into one.
3. Initialize dictionary with default value.
4. Create a dictionary by extracting the keys from a given dictionary.
5. Delete a list of keys from a dictionary.
6. Check if a value exists in a dictionary.
7. Rename key of a dictionary.
8. Get the key of a minimum value from the following dictionary.
9. Change value of a key in a nested dictionary

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ASSIGNMENT NO: III
(Array & String)

(All programs to be implemented in both C & Python Programming Language)

1. Write a program to print the sum of the diagonal element of the M*N square matrix.

2. Write a program to store following numbers (1 to 9) in a matrix in spiral manner.

1	2	3
8	9	4
7	6	5

3. Rotate a given matrix in 90^0.

Input:

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Output:

13	9	5	1
14	10	6	2
15	11	7	3
16	12	8	4

4. Write a program to check whether a matrix is sparse or not.

5. Given a square matrix, print the maximum length snake sequence in it. A snake sequence is defined as a sequence of numbers where each new number, which can only be located to the right or down of the current number, is either plus or minus one.

For example, we can either move right from any cell in the matrix (if that number is ± 1) or move down (if that number is ± 1). The problem is finding the longest path (snake sequence) through the matrix, keeping in mind that we can only move to a new cell whose value is ± 1 concerning the current cell.

For example, the maximum length snake sequence of the following matrix is $5 \text{ —> } 4 \text{ — >} 5 \text{ — > } 6 \text{ — >} 7 \text{ —> } 8 \text{ —> } 7 \text{ —> } 6$ as highlighted below:

7	5	3	2	1
3	4	1	4	4
1	5	6	7	8
3	4	5	8	9
3	2	2	7	6

6. Write a program to interchange different rows of a matrix.

7. Write a program to reverse a string.

8. Write a program to check whether a string is palindrome or not.

9. Write a program to print abbreviation of a given word. (1^{st} letter of each word)

10. Write a program to implement searching and sorting in a given list of words.

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ASSIGNMENT NO: IV
(Structure & Single Linked List)

(All programs to be implemented in both C & Python Programming Language)

1. Write a program to calculate difference between Start time & End time of an event. Time is expressed as hr-min-sec. Final result to be produced in seconds.

2. Write a program to collect height & weight of 'N' students. Find the highest weight/ height ratio.

3. Write a program to implement single linked list.

4. Write a program to perform insertion & deletion of element in a given list.

5. Write a program to merge two already sorted list.

6. Given a singly linked list of size **N**. The task is to **left-shift** the linked list by **k** nodes, where **k** is a given positive integer smaller than or equal to length of the linked list.

Sample Input: 2->4->7->8->9
K = 3

Output: 8->9->2->4->7

7. Write a program to reverse a list.

8. Given a singly linked list of size **N**. The task is to swap elements in the linked list pairwise. For example, if the input list is 1 2 3 4, the resulting list after swaps will be 2 1 4 3.

9. Write a program to detect a loop in a list.

10. Write a program to perform addition of two polynomials using linked list.

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ASSIGNMENT NO: V
(Doubly Linked List & Circular Linked List)

(All programs to be implemented in both C & Python Programming Language)

1. Write a program to implement a singly circular linked list.
2. Write a program to implement a doubly linked list.
3. Write a program to implement a doubly circular linked list.
4. Write a program to perform insertion & deletion of elements at different position of singly circular linked list.
5. Write a program to perform insertion & deletion of elements at different position of doubly linked list.
6. Write a program to perform insertion & deletion of elements at different position of doubly circular linked list.
7. Write a program to remove a particular character from a doubly linked list.
8. Write a program to divide doubly linked list from middle and rejoin them in reverse manner.
   Sample input: 1->2->3->4->5->6
   Output: 3->2->1->6->5->4
9. Write a program to reverse a doubly linked list.
10. Write a program to arrange a binary tree with a doubly linked list.

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ASSIGNMENT NO: VI
(Stack)

(All programs to be implemented in both C & Python Programming Language)

1. Write a program to implement stack using array.
2. Write a program to implement stack using linked list.
3. Write a program to check whether number of opening '(' & closing ')' parenthesis are equal or not.
4. Write a program to convert infix expression to postfix expression.
5. Write a program to evaluate a postfix expression.
6. Write a program to implement recursive & tail recursive version a) to find factorial of a number b) to find Fibonacci series.
7. Write a program to implement 'Tower of Hanoi' using recursion.
8. Write a program to convert a decimal number into binary number using stack.
9. Write a program to reverse a string using stack.
10. Write a program to implement multiple stacks in a single array.

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ASSIGNMENT NO: VII
(Queue)

(All programs to be implemented in both C & Python Programming Language)

1. Write a program to implement linear queue using array.
2. Write a program to implement linear queue using linked list.
3. Write a program to implement circular queue.
4. Write a program to implement multiple queues in a single array.
5. Write a program to implement 'Dequeue'.
6. Write a program to implement priority queue.
7. Write a program to implement a stack using queue.
8. Write a program to implement a queue using stack.
9. Write a program to reverse a queue.
10. Given a positive number 'n', generate binary numbers between 1 to n using

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ASSIGNMENT NO: VIII
(Searching & Sorting)

(All programs to be implemented in both C & Python Programming Language)

1. Write a program to implement linear search.
2. Write a program to implement binary search.
3. Write a program to implement interpolation search.
4. Write a program to search a number occurring odd number of times.
5. Write a program to implement bubble sort.
6. Write a program to implement selection sort.
7. Write a program to implement insertion sort.
8. Write a program to implement merge sort.
9. Write a program to implement quick sort.
10. Write a program to find three elements in the array such that their sum is equal to given element K.

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ASSIGNMENT NO: IX
(Hashing)

(All programs to be implemented in both C & Python Programming Language)

1. Given an unsorted integer array, find a pair with the given sum in it.
2. Check if a subarray with 0 sum exists or not.
3. Given an integer array, print all subarrays with zero-sum.
4. Given an integer array, find the maximum length subarray having a given sum.
5. Find maximum length subarray having an equal number of 0's and 1's
6. Find the largest subarray formed by consecutive integers
7. Find pairs with difference k in an array
8. Group elements of an array based on their first occurrence
9. Find the minimum index of a repeating element in an array
10. Sort elements by their frequency and index

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ASSIGNMENT NO: X
(Tree & Graph)

(All programs to be implemented in both C & Python Programming Language)

1. Write a program to create a binary tree.
2. Write a program to implement tree traversal.
3. Write a program to check whether a tree is full or complete.
4. Write a program to create a binary search tree.
5. Write a program to sort a given set of numbers using BST.
6. Write a program to find mirror image of a BST.
7. Write a program to implement a two way threaded binary tree.
8. Write a program to print adjacency list of a given graph.
9. Write a program to implement BFS algorithm.
10. Write a program to implement DFS algorithm.

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List of Lab Projects
(To be done using File Handling (C / Python))

1 project to be done by each student.

1. Student Record Management System.
2. Library Management System.
3. Movie Ticket Booking System.
4. Mini Voting System.
5. Banking Management System.