LAB - 1
Review of Fundamentals of Data Structure
PROGRAM EXERCISE

Lab. Exercise (LE)

1.1 Write a program to store random numbers into an array of n integers and then find out the smallest and largest number stored in it. n is the user input.

1.2 Write a program to store random numbers into an array of n integers, where the array must contains some duplicates. Do the following:

a) Find out the total number of duplicate elements.

b) Find out the most repeating element in the array.

1.3 Write a program to rearrange the elements of an array of n integers such that all even numbers are followed by all odd numbers. How many different ways you can solve this problem. Write your approaches & strategy for solving this problem.

1.4 Write a program that takes three variable (a, b, c) as separate parameters and rotates the values stored so that value a goes to be, b, b to c and c to a by using SWAP(x,y) function that swaps/exchanges the numbers x & y.

1.5 Let A be n*n square matrix array. WAP by using appropriate user defined functions for the following:

a) Find the number of nonzero elements in A

b) Find the sum of the elements above the leading diagonal.

c) Display the elements below the minor diagonal.

d) Find the product of the diagonal elements.

Home Exercise (LE)

1.6 Write a program to find out the second smallest and second largest element stored in an array of n integers. n is the user input. The array takes input through random number generation within a given range. How many different ways you can solve this problem. Write your approaches & strategy for solving this problem.

1.7 Write a program to swap pair of elements of an array of n integers from starting. If n is odd, then last number will be remain unchanged.

1.8 Write a program to display an array of n integers (n>1), where at every index of the array should contain the product of all elements in the array except the element at the given index. Solve this problem by taking single loop and without an additional array.

Input Array : 3 4 5 1 2

Output Array :40 30 24 120 60

1.9 Write a program using a function for computing $\lfloor\sqrt{n}\rfloor$ for any positive integer. Besides assignment and comparison, your algorithm may only use the four basic arithmetic operations.

Hints: In number theory, the integer square root (isqrt) of a positive integer n is the positive integer m which is the greatest integer less than or equal to the square root of n,

$$isqrt(n)=\lfloor\sqrt{n}\rfloor$$

Round Exercise (RE)

1.10 Assume that you are given a rudimentary programming language which contains only four operators, viz., +, −, abs and div. + and − have their usual meanings, while div(a, b) returns the quotient of a/b and abs(a) returns the absolute value of a. Write a program to solve this problem by using a function max(a, b) that takes two integers a and b as input and returns the maximum of the two. Note that you can only use the operators provided; in particular, the constructs ”if”, “while”, or “for” are not available.