Assignment-03

Instructions: (Read Carefully)

a. For each problem, you are supposed to do the best, average and worst-case analysis.

b. The proposed algorithm must be clearly explained and neatly written.

c. Try to show and compare the experimental results with the help of tables and suitable graphs.

d. Solve preferably using recursion.

Question Code	Questions
Q01	Given coordinates of two points (x_1, y_1) and (x_2, y_2) determine if there are any valid movements from one to other. Valid movements are (x, x + y) and (x + y, y).
Q02	Find an optimal way if you can reach a given number x from 0 when you move i steps in every i^{th} step. e.g. 3 takes 2 steps (0, 1) (1, 3) and 4 takes 3 steps (0, -1), (-1, 1) (1, 4).
Q03	Find whether a given number n reaches to 1 after changing it to n/2 if it is even or 3n+1 if odd.eg. n = 12, (12, 6, 3, 10, 5, 16, 8, 4, 2, 1)
Q04	In a selection scheme, people are selected from positions in multiples of 3. Assume people are standing in queue and every time a new queue is formed repeating the above selection process until a single person is left. Find out the position for a given n which gets a person selected.
Q05	There are N cats to be executed standing in circular way. They are executed in fixed direction (clockwise). In each step, k^{th} cat is executed. The execution proceeds until the last cat remains, who is given freedom. Find out a safe position for a cat.
Q06	Assume N, find out ascending sequences of N digit numbers such that every number in the sequence is itself strictly increasing.
Q07	Sort the elements of a stack in ascending order using recursion.
Q08	Express a given number X as the sum of N^{th} power of unique natural numbers. In many possible ways can this be done.
Q09	In a string of digits, check if its 3^{rd} partitioning is the sum of its first two partitions. Find out many such string is there for N length string.
Q10	Check if a rightmost substring can be written as sum of two substrings before it and same is recursively true for substrings before it.
Q11	Find the n^{th} term if function f is defined as f(n)= (1) +(2*3) + (4*5*6) ... n.
Q12	N persons are sitting on round table. How many ways these N people can make handshakes so that no two handshakes cross each other. N would be even. Eg: Handshake with 2-3 and 1-4 will cause cross.

	1 2 3 4
Q13	Generate an n*m matrix with value 0 and 1. A location (i, j) of matrix is given, replace the value by of that location by other than 0 or 1 and its adjacent locations also (excluding diagonally adjacent).
Q14	A string s is given, remove adjacent duplicate characters recursively. e.g. I/P: acaaabbbacdddd, O/P- acac.
Q15	Assume N*N matrix and each cell of matrix have some coins. Find the number of ways to reach bottom right cell of matrix from top left cell with exactly K coins. The movement should be (i+1, j) or (i, j+1) from a cell (i, j).
Q16	Assume an array of positive integers A and a sum B. Find all unique combinations in A such that sum is B. The same number is repeated unlimited number times from A.
Q17	Assume a set A {1,2,3…N} and P and Q be two subsets of A. Find the number of unordered pair of sets of (P, Q) such that P and Q are disjoint sets.
Q18	Generate M*N matrix and find all paths to reach from top left to bottom right such that movement should be right or down.
Q19	Assume an array with n elements and shuffle the array without using extra space.
Q20	Find all possible words by pressing these numbers as follows: 
Q21	Find out the possible expressions out of a given a string of integers from 0 to 9 such that the expression equals the target using binary operator +, – and *. I/p : “125”, Result : 7, o/p : {“1*2+5”, “12-5”}
Q22	With a string S find out all substrings with same character in start and end.
Q23	Generate power set of a given set.
Q24	Solve tower of Hanoi problem for n disks.

Q25	Convert a binary tree to BST by maintaining its original structure.
Q26	Binary to gray code conversion.
Q27	Print all Hamiltonian paths in a graph.