Lab Exercises

1. Write a program using the Brute Force Algorithm to search for overlapping occurrences of a pattern in a string. For example, in the text "ABABABA", the pattern "ABA" overlaps and should be detected at indices 0 and 2.

2. Given a grid of size n*m (n is the number of rows and m is the number of columns in the grid) consisting of '0's (Water) and '1's(Land). Find the number of islands.
   Note: An island is either surrounded by water or boundary of grid and is formed by connecting adjacent lands horizontally or vertically or diagonally i.e., in all 8 directions.

   Example 1:
   Input:
   grid = {{0,1},{1,0},{1,1},{1,0}}
   Output:
   1
   Explanation:
   The grid is-
   0 1
   1 0
   1 1
   1 0
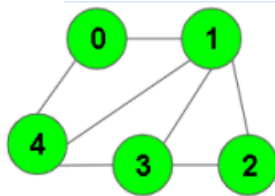   All lands are connected.

3. Given an undirected graph with V nodes and E edges, create and return an adjacency list of the graph. 0-based indexing is followed everywhere.
   Example 1:
   Input:
   V = 5, E = 7
   edges = {(0,1),(0,4),(4,1),(4,3),(1,3),(1,2),(3,2)}

   Output:
   {{1,4},
   {0,2,3,4},
   {1,3},
   {1,2,4},
   {0,1,3}}

Explanation:
Node 0 is connected to 1 and 4.
Node 1 is connected to 0,2,3 and 4.
Node 2 is connected to 1 and 3.
Node 3 is connected to 1,2 and 4.
Node 4 is connected to 0,1 and 3.

4. Modify the Knuth-Morris-Pratt Algorithm to perform a case-insensitive search. For example, in the text "Data Structures", the pattern "data", "DATA", "Data" all should match.

5. Extend the Boyer-Moore Algorithm to handle multiple patterns simultaneously. For example, given the text "ABCDEFG" and patterns {"ABC", "EFG"}, the algorithm should efficiently find all occurrences.

6. Use the Rabin-Karp Algorithm to find all substrings of a given string that are palindromes. For example, in the text "ABCBAB", identify palindromes like "BCB" and "BAB".