Practical 3:

Aim: - Write a program to construct DFA using given regular expression.

Theory: -

Regular Expression

- The language accepted by finite automata can be easily described by simple expressions called Regular Expressions. It is the most effective way to represent any language.
- The languages accepted by some regular expression are referred to as Regular languages.
- A regular expression can also be described as a sequence of pattern that defines a string.
- Regular expressions are used to match character combinations in strings. String searching algorithm used this pattern to find the operations on a string.

For instance:

In a regular expression, x* means zero or more occurrence of x.

It can generate {e, x, xx, xxx, xxxx, ...}

In a regular expression, x^+ means one or more occurrence of x.

It can generate {x, xx, xxx, xxxx, ...}

Operations on Regular Language

The various operations on regular language are:

- **Union:** If L and M are two regular languages then their union L U M is also a union.
  - L U M = {s | s is in L or s is in M}
- **Intersection:** If L and M are two regular languages then their intersection is also an intersection.
  - L ⋂ M = {st | s is in L and t is in M}
- **Kleen closure:** If L is a regular language then its Kleen closure L1* will also be a regular language.
  - L* = Zero or more occurrence of language L.

Example 1:

Write the regular expression for the language accepting all combinations of a's, over the set ∑ = {a}

Solution:

All combinations of a's means a may be zero, single, double and so on. If a is appearing zero times, that means a null string. That is we expect the set of {ε, a, aa, aaa, ...}. So we give a regular expression for this as:

1. R = a*

That is Kleen closure of a.

Example 2:

Write the regular expression for the language accepting all combinations of a's except the null string, over the set ∑ = {a}

Solution:

The regular expression has to be built for the language

1. L = {a, aa, aaa, ...}

This set indicates that there is no null string. So we can denote regular expression as:

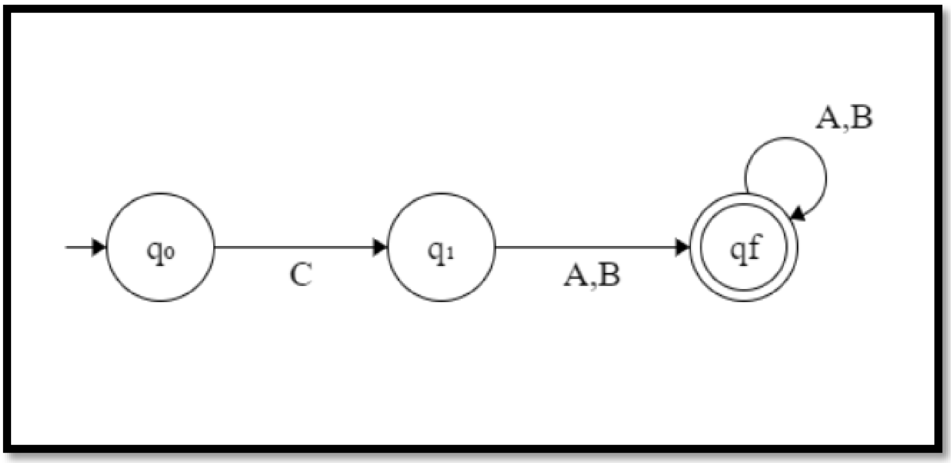
R = a^+

Output form

Given a string S, the task is to design a Deterministic Finite Automata (DFA) for accepting the language L = C (A + B)+. If the given string is accepted by DFA, then print "Yes". Otherwise, print "No".

Input: S = "CABABABAB"
Output: Yes
Explanation: The given string is of the form C(A + B)+ as the first character is C and it is followed by A or B.

Input: S = "ACCBBCCA"
Output: No

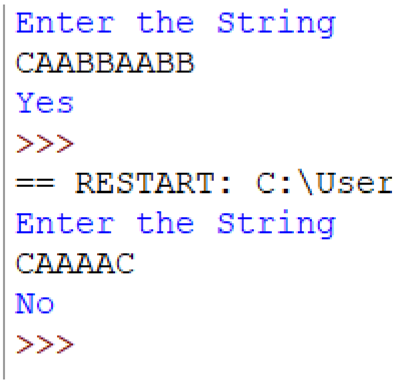


- If the given string is of length less than equal to 1, then print "No".
- If the first character is always C, then traverse the remaining string and check if any of the characters is A or B.
- If there exists any character other than A or B while traversing in the above step, then print "No".
- Otherwise, print "Yes".
- Below is the implementation of the above approach:

Program:-

```
# Function to find whether the given
# is Accepted by the DFA
def DFA(str, N):

    # If n <= 1, then prNo
    if (N <= 1):
        print("No")
        return

    # To count the matched characters
    count = 0

    # Check if the first character is C
    if (str[0] == 'C'):
        count += 1

        # Traverse the rest of string
        for i in range(1, N):

            # If character is A or B,
            # increment count by 1
            if (str[i] == 'A' or str[i] == 'B'):
                count += 1
            else:
                break
    else:
        # If the first character
        # is not C, pr-1
        print("No")
        return

    # If all characters matches
    if (count == N):
        print("Yes")
    else:
        print("No")

# Driver Code
if __name__ == '__main__':
    str = "CAABBAAB"
    N = len(str)
    DFA(str, N)
```

Output:-



```
Enter the String
CAABBAABB
Yes
>>>
== RESTART: C:\User
Enter the String
CAAAAC
No
>>>
```

Conclusion:-

The given program Successfully checks whether the given string is DFA or not.

References:-

https://www.javatpoint.com/automata-regular-expression

https://www.geeksforgeeks.org/program-to-construct-dfa-for-regular-expression-c-a-bQ