IUBAT – International University of Business Agriculture and Technology

Assignment No: 3

Title of Assignment:

Program for Turing Machine capable of recognizing the

language 1^n0^n where n>0

Course Name: Theory of Computation
Course Code: CSC 397

Submitted To:

Dr. Ehteshamul Haque
Faculty, Dept. of CSE

Submitted By:

Naimul Ferdous
ID: 13303042
Sec-C, CSC397

Submission Date: 20.11.2017

Formal definition of Turing Machine (TM)

A Turing Machine is a 7-tuple $(Q, \Sigma, \Gamma, \delta, q_0, q_{accept}, q_{reject})$, where Q, Σ, Γ are all finite sets and

1. Q is the set of states,
2. Σ is the input alphabet not containing the blank symbol B,
3. Γ is the tape alphabet, where $B \in \Gamma$ and $\Sigma \subseteq \Gamma$,
4. $\delta: Q \times \Gamma \rightarrow Q \times \Gamma \times \{L, R\}$ is the transition function,
5. $q_0 \in Q$ is the start state,
6. $q_{accept} \in Q$ is the accept state, and
7. $q_{reject} \in Q$ is the reject state, where $q_{reject} \neq q_{accept}$.

State Diagram
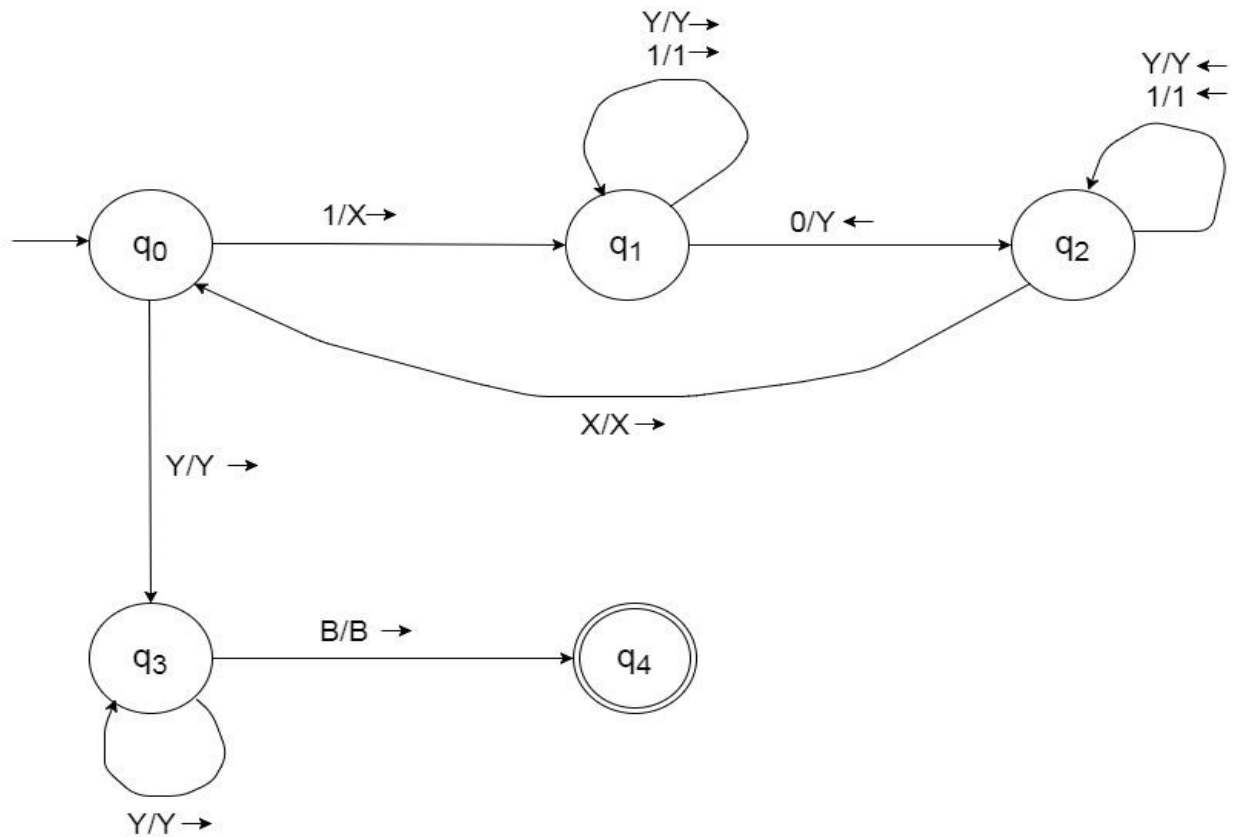
Here,

1. Q= {q_0, q_1, q_2, q_3, q_4}
2. Σ= {0, 1}
3. Γ= {0, 1, X, Y, B}
4. q_s= q_0
5. q_{accept} = {q_4}
6. q_{reject} = { Ø }
7. δ is given by the following transition table

Transition Table:

States\ Tape Symbols	0	1	X	Y	B
→q_0	Ø	(q_1, X, R)	Ø	(q_3, Y, R)	Ø
q_1	(q_2, Y, L)	(q_1, 1, R)	Ø	(q_1, Y, R)	Ø
q_2	Ø	(q_2, 1, L)	(q_0, X, R)	(q_2, Y, L)	Ø
q_3	Ø	Ø	Ø	(q_3, Y, R)	(q_4, B, R)
*q_4	Ø	Ø	Ø	Ø	Ø

Program

```c
#include<stdio.h>
#define BlankSpace '\0'

int main()
{
    char inpstr[50];
    int head, state;
    printf("Enter String: ");
    scanf("%s",inpstr);
    state=0;
    head=0;
    printf("\n");
    printf("%s ", inpstr);
    while(1)
    {
        if(state==0)
        {
            if(inpstr[head]=='1')
            {
                state=1;
                inpstr[head++]='X';
            }
            else if(inpstr[head]=='Y')
            {
                state=3;
                inpstr[head++]='Y';
            }
            else
            {
                state=5;
                break;
            }
        }
        else if(state==1)
        {
            if(inpstr[head]=='1')
            {
                state=1;
                inpstr[head++]='1';
            }
            else if(inpstr[head]=='Y')
            {
```

```
            state=1;
            inpstr[head++]='Y';
        }
        else if(inpstr[head]=='0')
        {
            state=2;
            inpstr[head--]='Y';
        }
        else
        {
            state==5;
            break;
        }
    }
    else if(state==2)
    {
        if(inpstr[head]=='1')
        {
            state=2;
            inpstr[head--]='1';
        }
        else if(inpstr[head]=='Y')
        {
            state=2;
            inpstr[head--]='Y';
        }
        else if(inpstr[head]=='X')
        {
            state=0;
            inpstr[head++]='X';
        }
        else
        {
            state=5;
            break;
        }
    }
    else if(state==3)
    {
        if(inpstr[head]=='Y')
        {
            state=3;
            inpstr[head++]='Y';
        }
        else if(inpstr[head]==BlankSpace)
        {
```

```c
                state=4;
                inpstr[head]=BlankSpace;
                break;
            }
            else
            {
                state=5;
                break;
            }
        }
        else
        {
            state=5;
            break;
        }
    }

    if(state==4)
        printf("   Accepted");
    else
        printf("   Rejected");

    printf("\n");

    return 0;
}
```

I/O:

Input: **11110000**
Output: **Accepted**

Input: **000111**
Output: **Rejected**

Input: **111100**
Output: **Rejected**