

CSC 4890: Introduction to the Theory of Computation

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SUBMIT ALL PROJECTS Electronically via Moodle

MAIN GOAL for Project #3:

To gain practical experience building a Turing Machine.

Today's date: Thursday, November 4, 2021

Due date: Monday, November 22, 2021. By 10:00 PM of that day

Maximum grade points = 100

ANNOUNCEMENT:

Recall that the TA for this class is Augustine Orgah. His email address is: aorgah1@lsu.edu

Consider the following language given in the textbook as Example 3.7:

EXAMPLE 3.7

Here we describe a Turing machine (TM) M_2 that decides $A = \{0^{2^n} \mid n \geq 0\}$, the language consisting of all strings of 0s whose length is a power of 2.

During a recent lecture we studied a Turing machine that decides this language. Write a computer program (in any language you wish. Do not use a library of programs that implement Turing machines. You will have to write the code from scratch) that implements this Turing machine. Demonstrate how your Turing machine would process the following strings:

(0)	$\bar{}$	{i.e., this is the empty string}
(1)	0	
(2)	00	
(3)	000	
(4)	0000	
(5)	00000	
(6)	000000	

For each string, your computer program should output the following information at each processing step: the state of the machine, how the tape looks like, and where the head of the tape is. Provide your source code with plenty of comments and instructions how one can run it on their PC. **Start working on it as soon as possible!**

Attach this form on front of your solutions with your name filled in

```
-----  
STRING - ''  
SEQUENCE:  
q1.  
.qR  
  
'' is not accepted by this Turing machine.  
-----
```

```
-----  
STRING - '0'  
SEQUENCE:  
q10  
.q2.  
..qA  
  
'0' is accepted by this Turing machine.  
-----
```

```
-----  
STRING - '00'  
SEQUENCE:  
q100  
.q20  
.Xq3.  
.q5X  
q5.X  
.q2X  
.Xq2.  
.X.qA  
  
'00' is accepted by this Turing machine.  
-----
```

```
-----  
STRING - '000'  
SEQUENCE:  
q1000  
.q200  
.Xq30  
.X0q4.  
.X0.qR  
  
'000' is not accepted by this Turing machine.  
-----
```

STRING - '0000'

SEQUENCE:

q10000
.q2000
.Xq300
.X0q40
.X0Xq3.
.X0q5X
.Xq50X
.q5X0X
q5.X0X
.q2X0X
.Xq20X
.XXq3X
.XXXq3.
.XXq5X
.Xq5XX
.q5XXX
q5.XXX
.q2XXX
.Xq2XX
.XXq2X
.XXXq2.
.XXX.qA

'0000' is accepted by this Turing machine.

STRING - '00000'

SEQUENCE:

q100000
.q20000
.Xq3000
.X0q400
.X0Xq30
.X0X0q4.
.X0X0.qR

'00000' is not accepted by this Turing machine.

STRING - '000000'

SEQUENCE:

q1000000
.q200000
.Xq30000
.X0q4000
.X0Xq300
.X0X0q40
.X0X0Xq3.
.X0X0q5X
.X0Xq50X
.X0q5X0X
.Xq50X0X
.q5X0X0X
q5.X0X0X
.q2X0X0X
.Xq20X0X
.XXq3X0X
.XXXq30X
.XXX0q4X
.XXX0Xq4.
.XXX0X.qR

'000000' is not accepted by this Turing machine.
