



Gradiance Online Accelerated Learning

Zayd

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based on Chapter 8 of HMU.

Help

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1. A Turing machine M with start state q_0 and accepting state q_f has the following transition function:

$\delta(q,a)$	0	1	B
q_0	$(q_0, 1, R)$	$(q_1, 1, R)$	(q_f, B, R)
q_1	$(q_2, 0, L)$	$(q_2, 1, L)$	(q_2, B, L)
q_2	-	$(q_0, 0, R)$	-
q_f	-	-	-

This Turing machine turns the input string to its complement and enters final state after adding a Blank to the end of the string.

Deduce what M does on any input of 0's and 1's. Hint: consider what happens when M is started in state q_0 at the left end of a sequence of any number of 0's (including zero of them) and a 1. Demonstrate your understanding by identifying the true transition of M from the list below.

- $q_0 0101 \vdash^* 1010 q_f$
- $q_0 1100 \vdash^* 1101 B q_f$
- $q_0 1010 \vdash^* 0101 B q_f$
- $q_0 0011 \vdash^* 1101 B q_f$

Answer submitted: **c)**

You have answered the question correctly.

2. A nondeterministic Turing machine M with start state q_0 and accepting state q_f has the following transition function:

$\delta(q,a)$	0	1	B
q_0	$\{(q_1, 0, R)\}$	$\{(q_1, 0, R)\}$	$\{(q_1, 0, R)\}$
q_1	$\{(q_1, 1, R), (q_2, 0, L)\}$	$\{(q_1, 1, R), (q_2, 1, L)\}$	$\{(q_1, 1, R), (q_2, B, L)\}$
q_2	$\{(q_f, 0, R)\}$	$\{(q_2, 1, L)\}$	$\{\}$
q_f	$\{\}$	$\{\}$	$\{\}$

First character is always made a 0. Turing machine then iterates over the string until it turns all characters to 1. It can at some point decide to go left over the string and stops once it reaches the 0 at the being,

Deduce what M does on any input of 0's and 1's. Demonstrate your understanding by identifying, from the list below, the ID that CANNOT be reached on some number of moves from the initial ID $q_010100101$.

- a) 011111111 q_1
- b) q_r 01111111
- c) 0 q_r 111111111
- d) 0111 q_2 1111111

Answer submitted: **b)**

You have answered the question correctly.

3. The Turing machine M has:

- States q and p ; q is the start state.
- Tape symbols 0, 1, and B; 0 and 1 are input symbols, and B is the blank.
- The following next-move function:

State	Tape	Move
	Symbol	
q	0	$(q, 0, R)$
q	1	$(p, 0, R)$
q	B	(q, B, R)
p	0	$(q, 0, L)$
p	1	none (halt)
p	B	$(q, 0, L)$

Your problem is to describe the property of an input string that makes M halt. Identify a string that makes M halt from the list below.

- a) 010001
- b) 1001
- c) 0000
- d) 010110

Answer submitted: **d)**

You have answered the question correctly.

4. A nondeterministic Turing machine M with start state q_0 and accepting state q_r has the following transition function:

$\delta(q, a)$	0	1	B
q_0	$\{(q_1, 0, R)\}$	$\{(q_1, 0, R)\}$	$\{(q_1, 0, R)\}$
q_1	$\{(q_1, 1, R), (q_2, 0, L)\}$	$\{(q_1, 1, R), (q_2, 1, L)\}$	$\{(q_1, 1, R), (q_2, B, L)\}$
q_2	$\{(q_r, 0, R)\}$	$\{(q_2, 1, L)\}$	$\{\}$
q_r	$\{\}$	$\{\}$	$\{\}$

Simulate all sequences of 5 moves, starting from initial ID q_01010 . Find, in the list below, one of the ID's reachable from the initial ID in EXACTLY 5 moves.

- a) 0111 q_1
- b) 011 q_2 1

First character is always made a 0. Turing machine then iterates over the string until it turns all characters to 1. It can at some point decide to go left over the string and stops once it reaches the 0 at the being,

c) 011111q₁d) 0q₂111Answer submitted: **b)**

You have answered the question correctly.

5. The Turing machine M has:

- States q and p; q is the start state.
- Tape symbols 0, 1, and B; 0 and 1 are input symbols, and B is the blank.
- The following next-move function:

State	Tape	Move
	Symbol	
q	0	(q,0,R)
q	1	(p,0,R)
q	B	(q,B,R)
p	0	(q,0,L)
p	1	none (halt)
p	B	(q,0,L)

Turing machine iterates over the string. When it encounters a 1, it turns it to a zero and enters state p. It then goes left one space, switches back to q and continues over the string. Can not have back to back 1's.

Simulate M on the input 1010110, and identify one of the ID's (instantaneous descriptions) of M from the list below.

- a) 101p0110
- b) 1p010110
- c) 0000q010
- d) 000q0110

Answer submitted: **d)**

You have answered the question correctly.