Solution to Homework Problem 17

Task. Use the general algorithm to transform a finite automaton B from Homework 1.4 – as simplified in Homework 3, into a Turing machine. Show step-by-step, on an example of a word $a01$, how this word will be processed by your Turing machine.

Automaton B from Homework 1.4 as simplified in Homework 2: reminder. This automaton has three states: s, c, and e; s is the starting state, c is the only final state. The transitions are as follows:

- from s, a leads to c, every other symbol leads to e;
- from c, every other symbol leads to c;
- from e, every symbol leads back to e.

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Solution. Here are the rules for the Turing machine:

start, – → R, s
s, a → R, c
s, 0 → R, e
s, 1 → R, e
c, a → R, c
c, 0 → R, c
c, 1 → R, c
e, a → R, e
e, 0 → R, e
e, 1 → R, e
s, – → reject
c, – → accept
e, – → reject

Tracing.

$\underline{-}$	a	0	1	–	...	start
–	$\underline{a}$	0	1	–	...	s
–	a	$\underline{0}$	1	–	...	c

$-$	a	0	$\underline{1}$	$-$	$\ldots$	c
$-$	a	0	1	$\underline{-}$	$\ldots$	c
$-$	a	0	1	$\underline{-}$	$\ldots$	accept