Solution to Homework Problem 17

Task. Use the general algorithm to transform a finite automaton from Homework 1.1 – as simplified in Homework 3, into a Turing machine. Show step-by-step, on an example of a word Aaa, how this word will be processed by your Turing machine.

Automaton from Homework 1.1 as simplified in Homework 2: reminder. This automaton has three states: s, n, and e; s is the starting state, n is the only final state. The transitions are as follows:

- from s, A leads to n, every other symbol leads to e;
- from n, a leads back to n, every other symbol leads to e;
- 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, n
s, a → R, e
s, 1 → R, e
n, A → R, e
n, a → R, n
n, 1 → R, e
s, – → reject
n, – → accept
e, – → reject

Tracing.

$\underline{-}$	A	a	a	–	...	start
–	$\underline{A}$	a	a	–	...	s
–	A	$\underline{a}$	a	–	...	n
–	A	a	$\underline{a}$	–	...	n
–	A	a	a	$\underline{-}$	...	n
–	A	a	a	$\underline{-}$	...	accept