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 Aaa, how this word will be processed by your Turing machine.

Automaton B from Homework 1.4 as simplified in Homework 3: reminder. This automaton has three states: s, n, and r; s is the starting state, n is the only final state. The transitions are as follows:

- from the state s, symbol r leads to r, every other symbol leads to n;
- from the state n, symbol r leads to r, every other symbol leads to n;
- from the state r, every symbol leads back to r.

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Solution. Here are the rules for the Turing machine:

start, – → R, s
s, r → R, r
s, a → R, n
s, A → R, n
n, r → R, r
n, a → R, n
n, A → R, n
r, r → R, r
r, a → R, r
r, A → R, r
s, – → reject
n, – → accept
r, – → reject

Tracing.

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

$-$	A	a	$\underline{a}$	$-$	$\ldots$	n
$-$	A	a	a	$\underline{-}$	$\ldots$	n
$-$	A	a	a	$\underline{-}$	$\ldots$	accept