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 1a, 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 two states: n and w; n is the starting state, and it is also the only final state. The transitions are as follows:

- from the state n, symbol 1 leads to n, every other symbol leads to w;
- from the state w, every symbol leads back to w.

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Solution. Here are the rules for the Turing machine:

start, – → R, n
n, 1 → R, n
n, a → R, w
n, ? → R, w
w, 1 → R, w
w, a → R, w
w, ? → R, w
n, – → accept
w, – → reject

Tracing.

$\underline{-}$	1	a	–	–	...	start
–	$\underline{1}$	a	–	–	...	n
–	1	$\underline{a}$	–	–	...	n
–	1	a	$\underline{-}$	–	...	w
–	1	a	$\underline{-}$	–	...	reject