Solution to Homework Problem 18

Homework Problem 18. Use the general algorithm to transform a finite automaton from Problem 3 into a Turing machine. Show step-by-step, on an example of a word $ABF$, how this word will be processed by your Turing machine.

Automaton from Problem 3: reminder. This automaton has two states: $g$ and $p$; $g$ is the starting state and the final state. The only three symbols are $A$, $B$, and $F$. From $g$, $A$ and $B$ lead back to $g$, and $F$ leads to $p$. From $p$, any symbol leads back to $p$.

Solution. Here are the rules for the Turing machine:

start, $-$ $\rightarrow$ R, $g$
$g$, $A$ $\rightarrow$ R, $g$
$g$, $B$ $\rightarrow$ R, $g$
$g$, $F$ $\rightarrow$ R, $p$
$p$, $A$ $\rightarrow$ R, $p$
$p$, $B$ $\rightarrow$ R, $p$
$p$, $F$ $\rightarrow$ R, $p$
p, $-$ $\rightarrow$ reject
$g$, $-$ $\rightarrow$ accept

Tracing.

\[ \begin{array}{cccc}
  - & A & B & F \\
  - & A & B & F \\
  - & A & B & F \\
  - & A & B & F \\
  - & A & B & F \\
  - & A & B & F \\
\end{array} \]

start
$g$
$g$
$g$
p
reject