Mod/Div Turing Machine

Submitted by

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1 Graph
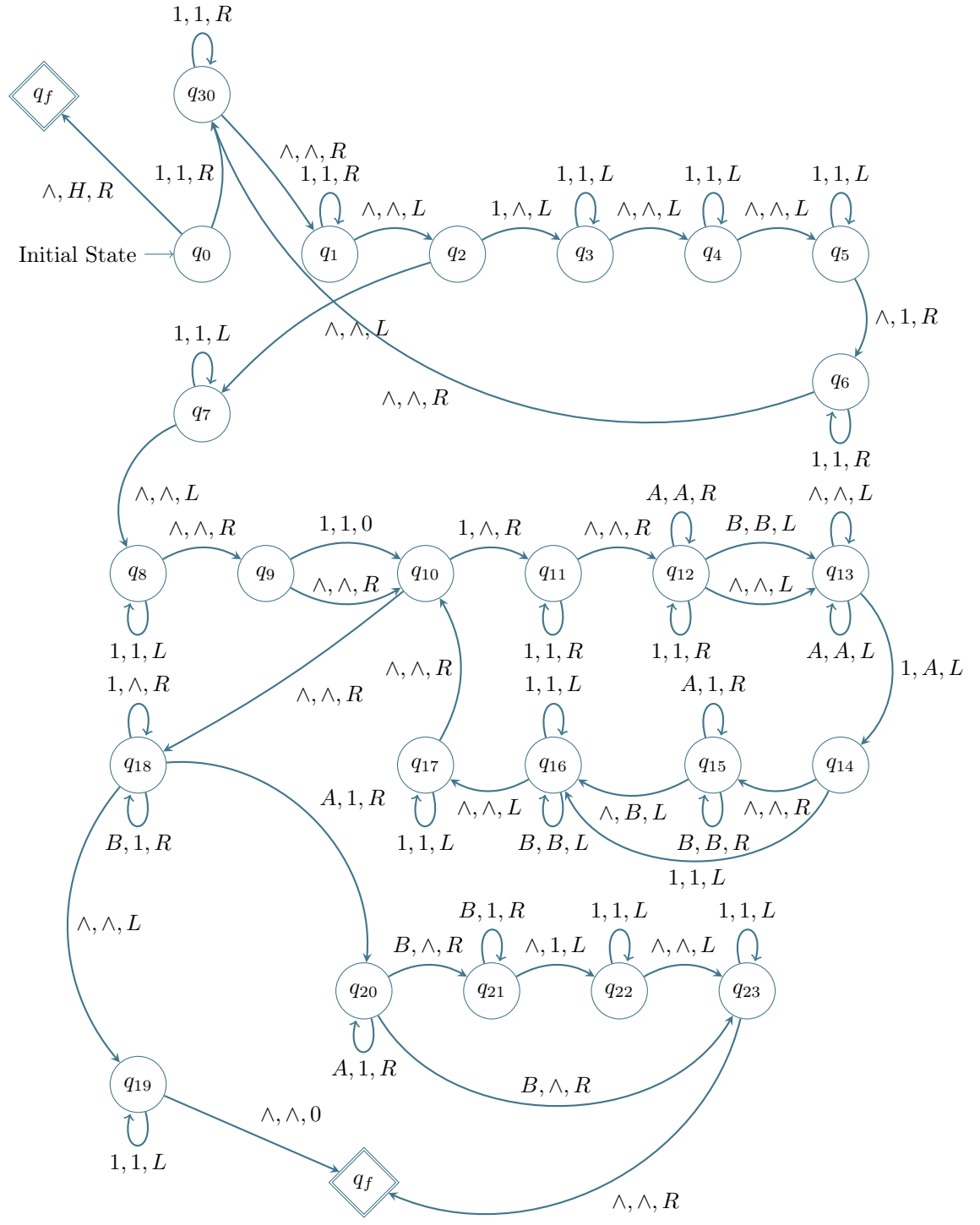
2 Mathematical Notation

$s_0 \equiv \wedge, s_1 \equiv 1, s_2 \equiv A, s_3 \equiv B, s_4 \equiv H$

$M_g = \{$
$((q_0, s_0) \rightarrow (q_f, s_4, 0)),$
$((q_0, s_1) \rightarrow (q_{30}, s_1, R)),$
$((q_1, s_1) \rightarrow (q_1, s_1, R)),$
$((q_1, s_0) \rightarrow (q_2, s_0, L)),$
$((q_{30}, s_1) \rightarrow (q_{30}, s_1, R)),$
$((q_{30}, s_0) \rightarrow (q_1, s_0, R)),$
$((q_2, s_0) \rightarrow (q_7, s_0, L)),$
$((q_2, s_1) \rightarrow (q_3, s_0, L)),$
$((q_3, s_1) \rightarrow (q_3, s_1, L)),$
$((q_3, s_0) \rightarrow (q_4, s_0, L)),$
$((q_4, s_1) \rightarrow (q_4, s_1, L)),$
$((q_4, s_0) \rightarrow (q_5, s_0, L)),$
$((q_5, s_1) \rightarrow (q_5, s_1, L)),$
$((q_5, s_0) \rightarrow (q_6, s_1, R)),$
$((q_6, s_1) \rightarrow (q_6, s_1, R)),$
$((q_6, s_0) \rightarrow (q_{30}, s_0, R)),$
$((q_7, s_1) \rightarrow (q_7, s_1, L)),$
$((q_7, s_0) \rightarrow (q_8, s_0, L)),$
$((q_8, s_1) \rightarrow (q_8, s_1, L)),$
$((q_8, s_0) \rightarrow (q_9, s_0, R)),$
$((q_9, s_1) \rightarrow (q_{10}, s_1, 0)),$
$((q_9, s_0) \rightarrow (q_{10}, s_0, R)),$
$((q_{10}, s_1) \rightarrow (q_{11}, s_0, R)),$
$((q_{10}, s_0) \rightarrow (q_{18}, s_0, R)),$
$((q_{11}, s_1) \rightarrow (q_{11}, s_1, R)),$
$((q_{11}, s_0) \rightarrow (q_{12}, s_0, R)),$
$((q_{12}, s_1) \rightarrow (q_{12}, s_1, R)),$
$((q_{12}, s_2)) \rightarrow (q_{12}, s_2), R)),$
$((q_{12}, s_3)) \rightarrow (q_{13}, s_3), L)),$
$((q_{12}, s_0) \rightarrow (q_{13}, s_0, L)),$
$((q_{13}, s_0) \rightarrow (q_{13}, s_0, L)),$
$((q_{13}, s_2)) \rightarrow (q_{13}, s_2), L)),$
$((q_{13}, s_1) \rightarrow (q_{14}, s_2), L)),$
$((q_{14}, s_0) \rightarrow (q_{15}, s_0, R)),$
$((q_{14}, s_1) \rightarrow (q_{16}, s_1, L)),$
$((q_{15}, s_2)) \rightarrow (q_{15}, s_1, R)),$
$((q_{15}, s_3)) \rightarrow (q_{15}, s_3), R)),$
$((q_{15}, s_0) \rightarrow (q_{16}, s_3), L)),$

$((q_{16}, s_1) \rightarrow (q_{16}, s_1, L)),$
$((q_{16}, s_3)) \rightarrow (q_{16}, s_3), L)),$
$((q_{16}, s_0) \rightarrow (q_{17}, s_0, L)),$
$((q_{17}, s_1) \rightarrow (q_{17}, s_1, L)),$
$((q_{17}, s_0) \rightarrow (q_{10}, s_0, R)),$
$((q_{18}, s_1) \rightarrow (q_{18}, s_0, R)),$
$((q_{18}, s_3)) \rightarrow (q_{18}, s_1, R)),$
$((q_{18}, s_2)) \rightarrow (q_{20}, s_1, R)),$
$((q_{18}, s_0) \rightarrow (q_{19}, s_0, L)),$
$((q_{19}, s_1) \rightarrow (q_{19}, s_1, L)),$
$((q_{19}, s_0) \rightarrow (q_f, s_0, 0)),$
$((q_{20}, s_2)) \rightarrow (q_{20}, s_1, R)),$
$((q_{20}, s_3)) \rightarrow (q_{21}, s_0, R)),$
$((q_{20}, s_0) \rightarrow (q_{23}, s_0, L)),$
$((q_{21}, s_3)) \rightarrow (q_{21}, s_1, R)),$
$((q_{21}, s_0) \rightarrow (q_{22}, s_1, L)),$
$((q_{22}, s_1) \rightarrow (q_{22}, s_1, L)),$
$((q_{22}, s_0) \rightarrow (q_{23}, s_0, L)),$
$((q_{23}, s_1) \rightarrow (q_{23}, s_1, L)),$
$((q_{23}, s_0) \rightarrow (q_f, s_0, R)),$
$\}$

3 Input (3, 5)

(i) The TM starts by checking if the head starts at a $\wedge$ (blank) then the divisor is 0 and the ticket is invalidated and the TM halts. Otherwise the divisor is a natural number and the TM goes to the rightmost of the divisor until we reach a blank.

q_0: $\wedge \wedge \wedge$@111$\wedge$11111$\wedge \wedge \wedge$
q_{30}: $\wedge \wedge \wedge$1@11$\wedge$11111$\wedge \wedge \wedge$
q_{30}: $\wedge \wedge \wedge$11@1$\wedge$11111$\wedge \wedge \wedge$
q_{30}: $\wedge \wedge \wedge$111@$\wedge$11111$\wedge \wedge \wedge$

(ii) Check if there is a dividend (any 1 ,unary input) and go to the rightmost, Otherwise (if blank, $\wedge$) then copying is done and go to DIV/MOD part of TM. .