Theory of Computation, Fall 2022
Assignment 7 Solutions

Q1. (20 pts)
$M_{\rightarrow} = (\{s, h\}, \Sigma, \delta, s, \{h\})$, where $\delta(s, a) = (h, \rightarrow)$ for any $a \in \Sigma$.

Q2. (50 pts)
$M = (K, \Sigma, \delta, s, H)$
$\bullet K = K_1 \cup K_2 \cup K_3 \cup \{h\}$
$\bullet s = s_1$
$\bullet H = H_2 \cup H_3 \cup \{h\}$
$\bullet$for $q \in K - H$, for each $c \in \Sigma$
(i) If $q \in K_1 - H_1$, $\delta(q, c) = \delta_1(q, c)$
(ii) If $q \in H_1$, $\delta(q, a) = (s_2, a), \delta(q, b) = (s_3, b), \delta(q, c) = (h, \rightarrow)$ for any $c \in \Sigma - \{a, b\}$
(iii) If $q \in K_2 - H_2$, $\delta(q, c) = \delta_2(q, c)$
(iiii) If $q \in K_3 - H_3$, $\delta(q, c) = \delta_3(q, c)$

Q3. (30 pts)
The Turing machine is shown as follows.