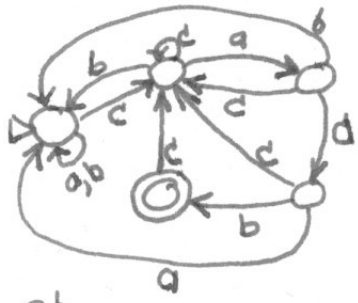
SI472 6-Week Exam

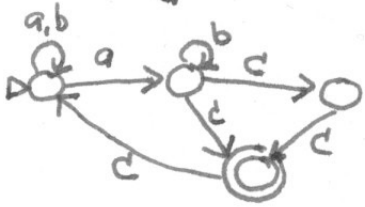
① 

Label as accept or reject:

a) bccaabb

b) cbaacaab

c) caabaacc

② 

Label as accept or reject:

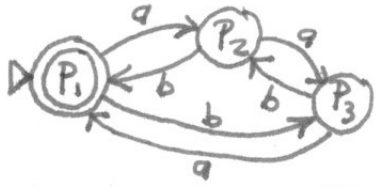
a) abbabbcc

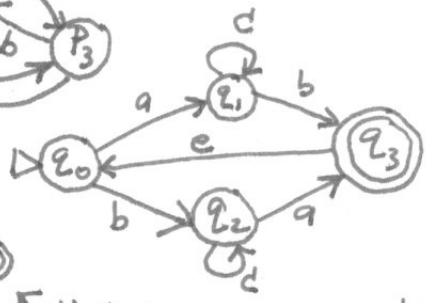
b) accabac

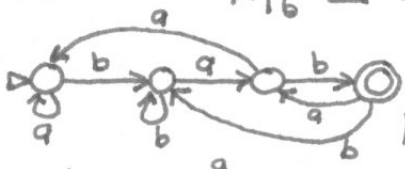
c) bbaccbc

③ Draw the diagram for $M_3 = \left(\{q_0,q_1,q_2\}, \{0,1\}, \begin{array}{c|cc} & 0 & 1 \\ \hline q_0 & q_0 & q_0 \\ q_1 & q_0 & q_2 \\ q_2 & q_2 & q_2 \end{array}, q_1, \{q_0,q_2\}\right)$

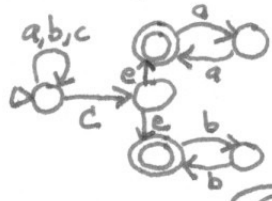
④ Draw the diagram for $M_4 = \left(\{0,1,2\}, \{a,b,c\}, \{(0,a,1),(0,b,1),(1,a,0),(1,b,0),(1,c,2)\}, 0, \{0,2\}\right)$

⑤ Give the 5-tuple for the deterministic finite automaton $M_5 =$ 

⑥ Give the 5-tuple for the non-deterministic finite automaton $M_6 =$ 

⑦ Give a concise English language description of the language accepted by this machine: 

Hint: try some sample strings and see what it takes to be accepted!

⑧ Give a concise English description of the language accepted by 

⑨ <u>Mystery Algorithm I</u>

Input: $M = (Q, \Sigma, \delta, s, W)$ and $x \in \Sigma$

Output: $M' = (Q \cup \{\$,\#\}, \Sigma, \delta', \$, W)$ where $\$,\# \notin Q$ and

$\delta' : (Q \cup \{\$,\#\}) \times \Sigma \to Q \cup \{\$,\#\}$

$$\delta'(q,z) = \begin{cases} \delta(q,z) & \text{if } q \in Q \\ \delta(s,x) & \text{if } q = \$ \text{ and } z = x \\ \# & \text{otherwise} \end{cases}$$

a) Show the 5-tuple produced for input $M = \left(\{q_0,q_1\}, \{a,b\}, \begin{array}{c|cc} & a & b \\ \hline q_0 & q_1 & q_1 \\ q_1 & q_0 & q_0 \end{array}, q_0, \{q_0\}\right)$ and $x = b$.

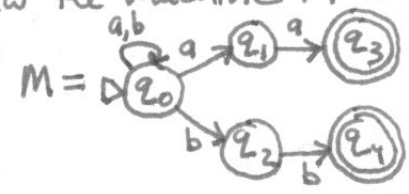
b) Draw the machine M' from part a).

c) Give a concise English description of what this algorithm accomplishes. Not just for the example input, but for <u>any</u> machine M and character x.

⑩ <u>Mystery Algorithm II</u>

Input: $M = (Q, \Sigma, \Delta, s, W)$, $x \in \Sigma$

Output: $M' = (Q \cup \{\$\}, \Sigma, \Delta', s, W \cup \{\$\})$ where $\$ \notin Q$ and $\Delta' = \Delta \cup \{(\$,x,\$)\} \cup W \times \{e\} \times \{\$\}$

a) Draw the machine M' for input $x = c$ and $M =$ 

b) Give a concise English description of what this algorithm accomplishes. Not just for the example input, but for <u>any</u> machine M and character x.