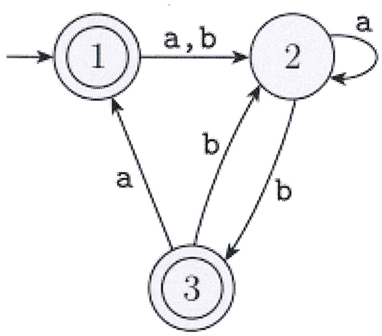
Name: Key **CS301 F1**

1. Consider the DFA, M_0, whose state diagram is given below.

   (a) (__ /**1 pt**) List the sequence of states M_0 goes through on input `abab`.

   (b) (__ /**1 pt**) Does M_0 accept any string of length 6?

   (c) (__ /**2 pts**) Let δ be the transition function of M_0. For what values of q does $\delta(q, \mathtt{a}) = 2$?



ⓐ 1 2 3 1 2

ⓑ No. for example, aaaaaa is not accepted.

ⓒ Note that $\delta(1, a) = 2$
$\delta(2, a) = 2$

However, $\delta(3, a) \neq 2$. So $\{1, 2\}$

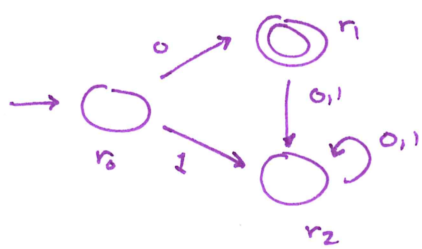
2. Consider the alphabet $\Gamma = \{0, 1\}$ and the following languages.

$$A_1 = \{0\} \text{ and } A_2 = \{w \mid w \text{ has an } \cancel{\text{odd}}\ \text{even length}\}$$

   (a) (__ /**1.5 pts**) Give a state diagram of a DFA, M_1, recognizing A_1.

   (b) (__ /**1.5 pts**) Give a state diagram of a DFA, M_2, recognizing A_2.

   (c) (__ /**3 pts**) Combine your state diagrams of M_1 and M_2 to give a state diagram of a DFA, M_3, which recognizes $A_1 \cup A_2$.

ⓐ


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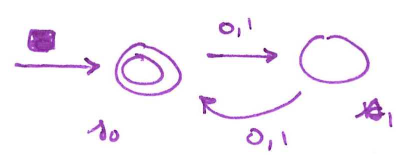

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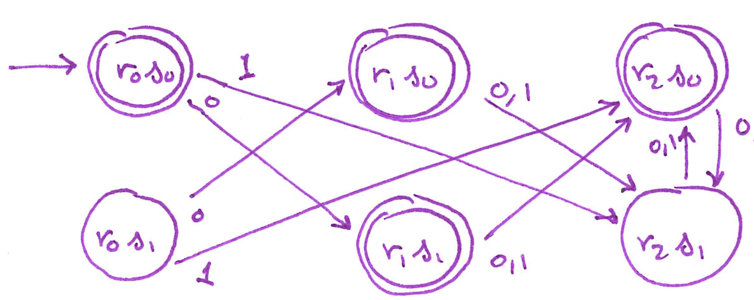

NOTE: State $r_0 s_1$ can be deleted, and then $r_1 s_0$ may be deleted.