CS 321: Assignment 2

Jared Wasinger

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1. Answer:
   $Q = \{q_0, q_1, q_2, q_3, q_4, q_5, q_6\}$
   $F = \{q_5, q_6\}$

   Transition table

State	a	b
$\{q_0\}$	$\{q_0, q_1\}$	$\{q_0, q_2\}$
$\{q_1\}$	$\{q_1, q_3\}$	$\{q_1\}$
$\{q_2\}$	$\{q_2\}$	$\{q_2, q_4\}$
$\{q_3\}$	$\{q_3, q_5\}$	$\{q_3\}$
$\{q_4\}$	$\{q_4\}$	$\{q_4, q_6\}$
$\{q_5\}$	$\{q_5\}$	$\{q_5\}$
$\{q_6\}$	$\{q_6\}$	$\{q_6\}$

2. Answer: $Q = \{(1), (1, 2, 3, 4), (1, 2, 3)\}$ $F = \{q_5, q_6\}$

   Transition table

State	a	b
$\{1\}$	$\{1, 2, 3, 4\}$	$\emptyset$
$\{1, 2, 3, 4\}$	$\{1, 2, 3, 4\}$	$\{1, 2, 3\}$

3. TODO

4. Answer:

   (a) Let A be the set of all strings with '011' inserted only once: $\Sigma_A = \{0, 1\}$
   $Q_A = \{q_0, q_1, q_2, q_3, q_4, q_5, q_6\}$
   $F_A = \{q_3, q_4, q_5\}$
   A Transition Table:

State	0	1
q_0	q_1	q_0
q_1	q_0	q_2
q_2	q_0	q_3
q_3	q_4	q_3
q_4	q_3	q_5
q_5	q_3	q_6
q_6	q_6	q_6

(b) Let B be the set of all strings divisible by 3. $\Sigma_B = \{0,1\}$
$Q_B = \{q_0, q_1, q_2\}$
$F_B = \{q_0\}$
B Transition Table:

State	0	1
q_0	q_0	q_1
q_1	q_2	q_0
q_2	q_1	q_2

(c) Then, the final answer $C = A \cap B$

(d) Intersection is closed under the set of regular languages so C is regular.