

CS 321: Assignment 2

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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: $Q = \{\{1\}, \{1, 2\}, \{1, 2, 3\}, \{1, 2, 3, 4\}\}$ $F = \{q_5, q_6\}$

Transition table

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

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.