

## CSE 311 Quiz Section: November 15, 2012 (Solutions)

### 1 Review of Relations

List the ordered pairs in the relation  $R$  from  $A = \{0, 1, 2, 3, 4\}$  to  $B = \{0, 1, 2, 3\}$  where  $(a, b) \in R$  iff:

a)  $a = b$

**Solution:**  $\{(0, 0), (1, 1), (2, 2), (3, 3)\}$

b)  $a \mid b$

**Solution:**  $\{(1, 0), (1, 1), (1, 2), (2, 0), (2, 2), (3, 0), (3, 3), (4, 0)\}$

c)  $\gcd(a, b) = 1$

**Solution:**  $\{(0, 1), (1, 0), (1, 1), (1, 2), (1, 3), (2, 1), (2, 3), (3, 1), (3, 3), (4, 1), (4, 3)\}$

### 2 Relational Properties

For each of these relations on the set  $\{1, 2, 3, 4\}$ , decide whether it is reflexive, whether it is symmetric, whether it is antisymmetric, and whether it is transitive.

a)  $\{(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)\}$

**Solution:** Transitive

b)  $\{(1, 1), (2, 2), (3, 3), (4, 4)\}$

**Solution:** Reflexive, transitive, symmetric, antisymmetric (all four)

c)  $\{(1, 2), (2, 3), (3, 4)\}$

**Solution:** Antisymmetric

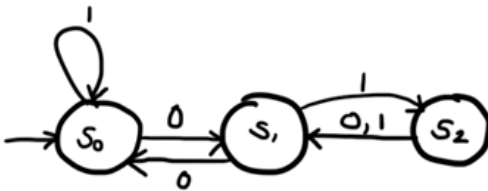
### 3 Finite State Machines

Draw the state diagrams for the finite-state machines with these state tables:

a)

	<i>f</i>	
	<i>Input</i>	
	<b>0</b>	<b>1</b>
<i>s</i> <sub>0</sub>	<i>s</i> <sub>1</sub>	<i>s</i> <sub>0</sub>
<i>s</i> <sub>1</sub>	<i>s</i> <sub>0</sub>	<i>s</i> <sub>2</sub>
<i>s</i> <sub>2</sub>	<i>s</i> <sub>1</sub>	<i>s</i> <sub>1</sub>

**Solution:**

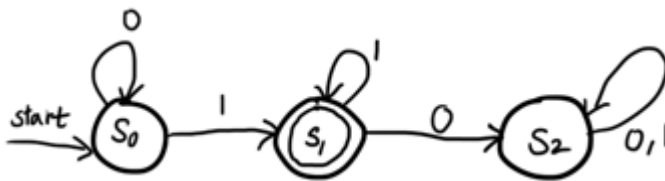


b)

	<i>f</i>	
	<i>Input</i>	
	<b>0</b>	<b>1</b>
<i>s</i> <sub>0</sub>	<i>s</i> <sub>0</sub>	<i>s</i> <sub>1</sub>
<i>s</i> <sub>1</sub>	<i>s</i> <sub>2</sub>	<i>s</i> <sub>1</sub>
<i>s</i> <sub>2</sub>	<i>s</i> <sub>2</sub>	<i>s</i> <sub>2</sub>

What language does this generate if  $S = F = \{s_1\}$ ?

**Solution:**



This FSM generates the language specified by the regular expression  $0^*11^*$ .