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) 

<table>
<thead>
<tr>
<th>Input</th>
<th>s0</th>
<th>s1</th>
<th>s2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>s0</td>
<td>s1</td>
<td>s1</td>
</tr>
<tr>
<td>1</td>
<td>s1</td>
<td>s2</td>
<td>s2</td>
</tr>
</tbody>
</table>

Solution:

![Finite State Machine Diagram a)](image)

b) 

<table>
<thead>
<tr>
<th>Input</th>
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<th>s1</th>
<th>s2</th>
</tr>
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<tr>
<td>0</td>
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<td>1</td>
<td>s1</td>
<td>s1</td>
<td>s2</td>
</tr>
</tbody>
</table>

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

Solution:

![Finite State Machine Diagram b)](image)

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