CMSC 330 Spring 2017 Quiz #3

Name (as it appears on Gradescope) _____________________________________________

Discussion Time (circle one)  
10am  
11am  
12noon  
1pm  
2pm  
3pm

Discussion TA (circle one)  
Aaron  
Alex  
Austin  
Ayman  
BT  
Daniel  
Eric  
Greg  
Jake  
JT  
Sam  
Tal  
Vitung

Instructions
● Do not start this quiz until you are told to do so.
● You have 15 minutes for this quiz.
● This is a closed book quiz. No notes or other aids are allowed.
● For partial credit, show all of your work and clearly indicate your answers.

1a. (1 point) Describe the language accepted by the following grammar:

$$S \rightarrow S \text{ and } S \mid S \text{ or } S \mid (S) \mid \text{True} \mid \text{False}$$

boolean expressions

1b. (4 points) Write a left-most derivation of "(True and False) and True"

$$S \rightarrow S \text{ and } S \rightarrow (S) \text{ and } S \rightarrow (S \text{ and } S) \text{ and } S \rightarrow (\text{True and } S) \text{ and } S \rightarrow (\text{True and False}) \text{ and } S \rightarrow (\text{True and False}) \text{ and } \text{True}$$

2. (5 points) Write a grammar for $$a^x b^y a^z$$, where $$z = x + y$$ and $$x, y, z \geq 0$$.

$$S \rightarrow aSa \mid T$$
$$T \rightarrow bTa \mid e$$
3. (5 points) Reduce the regular expression "a(a | b)*b" to an NFA.

4. (5 points) Reduce the following NFA to a DFA.
<table>
<thead>
<tr>
<th>State</th>
<th>Move</th>
<th>&amp; Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a → 2</td>
<td>1, 2</td>
</tr>
<tr>
<td></td>
<td>b → ∅</td>
<td>3, 4</td>
</tr>
<tr>
<td>1, 2</td>
<td>a → 2</td>
<td>1, 2</td>
</tr>
<tr>
<td></td>
<td>b → 3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>c → 4</td>
<td>3, 4</td>
</tr>
<tr>
<td>3, 4</td>
<td>a → 2</td>
<td>1, 2</td>
</tr>
<tr>
<td></td>
<td>b → ∅</td>
<td>3</td>
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<tr>
<td></td>
<td>c → 3</td>
<td>3</td>
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<tr>
<td>3</td>
<td>a → 2</td>
<td>1, 2</td>
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<tr>
<td></td>
<td>b → ∅</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>c → ∅</td>
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</tbody>
</table>

![Diagram](image)