CS3102 – Theory of Computation

Midterm Examination – Spring 2012
University of Virginia

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- This is a take-home open-book open notes pledged exam.
- Note: while for your convenience the “possession time” of this exam is extended up to 24 hours, the actual “work time” for this exam is up to six contiguous hours.
- No collaborations, Web searches, nor communications with others are allowed during the exam.
- Do as many of the problems as you can; please explain/prove all answers.
- Shorter proofs / explanations are much preferable to longer ones (Occam's razor!).
- Clearly state the short answer / proof idea first, and then your complete proof / explanation.
- Submit only the pages provided (use more sheets only if absolutely necessary).
- Derive answers on scratch paper first, then copy them neatly onto these pages.

During the exam, please feel free to ask clarifying questions using Email; responses will be posted to the class Web page (so please look at the class Web page often during this exam).

When you are done with this exam, please return it to me or to the TA (or you may slip your completed exam under my office door at 406 Rice Hall).

Good Luck!

Name: ________________________________

Problem 1: 20 ____________
Problem 2: 20 ____________
Problem 3: 20 ____________
Problem 4: 20 ____________
Problem 5: 20 ____________
Problem 6: 20 ____________
Problem 7: 20 ____________
Total: 140 ____________
1) Solve problem 2 on problem set 2.

**Short answer (circle one):** False

**Proof:**
2) Solve problem 8 on problem set 2.

Short answer (circle one): a. True False

Proof:

Short answer (circle one): b. True False

Proof:
3) Solve problem 12 on problem set 2.

**Short answer (circle one):**  
Countable  
Not Countable

**Proof:**
4) Solve problem 29 on problem set 2.

<table>
<thead>
<tr>
<th>Short answer (circle one):</th>
<th>Regular</th>
<th>Not Regular</th>
</tr>
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<tbody>
<tr>
<td>Proof:</td>
<td></td>
<td></td>
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5) Solve problem 16 on problem set 2.

**Short answer (circle one):**

a. True  
False

**Proof:**

**Short answer (circle one):**

b. True  
False

**Proof:**
Short answer (circle one): c. True False

Proof:

Short answer (circle one): d. True False

Proof:
6) Solve problem 33 on problem set 2.

**Short answer (characterization):**

**Proof:**
7) Solve problem 34a on problem set 2.

**Short answer (circle one):**

Yes  No

**Proof:**

"Once you eliminate the impossible, whatever remains, no matter how improbable, must be the truth."

- Sherlock Holmes (by Sir Arthur Conan Doyle, 1859-1930)