CS3102 – Theory of Computation

Midterm Examination – Spring 2016
University of Virginia

Gabriel Robins

- This is a 6-hour take-home open-book, open notes, pledged exam.
- Note: while for your convenience the “possession time” of this exam is up to 24 hours, the actual “work time” to complete this exam should not exceed 6 contiguous hours.
- No collaborations, no 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 explanations / proofs / algorithms are much preferable to longer ones.
- Clearly state the short proof/idea first, and then your complete proof.
- 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 slip it under my office door (406 Rice Hall).

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): True False

Proof:
2) Solve problem 7 on problem set 2.

**Short answer (circle one):**

a. True  
False

**Proof:**

**Short answer (circle one):**

b. True  
False

**Proof:**
3) Solve problem 11 on problem set 2.

**Short answer (circle one):**  

<table>
<thead>
<tr>
<th>Countable</th>
<th>Not Countable</th>
</tr>
</thead>
</table>

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

Short answer (circle one):  

Proof:
5) Solve problem 16 on problem set 2.

**Proof:**

**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:**

a. Proof:
b. 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)