

Name: _____

1. (1 pt.)

- **Read all material carefully.**
- You may refer to your books, papers, and notes during this test.
- No computer or network access of any kind is allowed (or needed).
- Write, and draw, carefully. Ambiguous or cryptic answers receive zero credit.
- Use textbook and classroom conventions for notation, algorithmic options, etc.
- Ask for clarifications on the above if needed.

Write your name in the space provided above.

2. (14 pts.) Use the method described in the proof of Lemma 1.60 in the textbook to convert the following regular expression to an NFA. *Depict intermediate steps and ensure you follow that method.*

$$((a \cup bb \cup cc^*)a)^*$$

[additional space for answering the earlier question]

3. (10 pts.) Depict an NFA that accepts the language $A \cup B$ where $A = \{a^{2i} \mid i \geq 0\}$ and $B = \{a^{3i} \mid i \geq 0\}$. You may assume an alphabet $\{a\}$. *Explain* briefly why your answer is correct.

4. (10 pts.) Provide a DFA that is equivalent to the automaton of Question 3. You are *not* required to use the mechanical method of conversion, though you may. *Explain* briefly why your answer is correct.

5. (10 pts.) Provide a context-free grammar that generates the language accepted by the automaton of Question 4. *Explain* briefly why your answer is correct.