Name: _____

1. (1 pt.)
   - **Read all material carefully.**
   - *If in doubt whether something is allowed, ask, don't assume.*
   - You may refer to **your** books, papers, and notes during this test. (No sharing of material.)
   - **E-books** may be used **subject to the restrictions** noted in class. (Briefly, do only those things with an e-book that are just as easily done with a physical book.)
   - **Computers of any kind** (including tablets, phones, and similar devices) are **not permitted** except when used exclusively as e-book readers.
   - **Network access** of any kind (cell, voice, text, data, ...) is **not permitted**.
   - Write, and draw, neatly and carefully. Ambiguous or cryptic answers receive zero credit.
   - Use class and textbook **conventions** for notation, algorithmic options, etc.
   - Questions that ask for **explanations** allocate a sizable fraction of points to those. (Answers without explanations will score very poorly.)
   - Budget your **time**, noting that *number of points = number of minutes.*

Write your name in the space provided above.
Do not write anything else on this page.

WAIT UNTIL INSTRUCTED TO CONTINUE TO REMAINING QUESTIONS.

(Do not view any other pages.)

Do not write on this page.
(It is for use in grading only.)

Q	Full	Score
1	1	
2	14	
3	15	
4	15	
total	45	

2. (14 pts.) Given languages L_1 and L_2, define $L_1L_2 = \{xy \mid x \in L_1 \wedge y \in L_2\}$.
   Prove or disprove: If L_1 and L_2 are prefix-free languages then L_1L_2 is also prefix-free.

[additional space for earlier material]

3. (15 pts.) Depict an NFA that accepts the language $A \cup B$ where $A = \{\mathtt{a}^{2i} \mid i \geq 0\}$ and $B = \{\mathtt{a}^{3i} \mid i \geq 0\}$. You may assume an alphabet $\{\mathtt{a}\}$. Prove correctness as precisely as possible.

[additional space for earlier material]

4. (15 pts.) Provide a DFA that is equivalent to the automaton of Question 3. You are *not* required to use the mechanical method of conversion, although you may. Prove correctness as precisely as possible.

[additional space for earlier material]