

Print Family (i.e., Last) Name: \_\_\_\_\_

Print Given (i.e., First) Name: \_\_\_\_\_

Student ID Number: \_\_\_\_\_

For each question, write the answer next to the question. If you need to use scratch paper, use the back of the quiz. Any scratch work in the answer spaces will be marked wrong and points will be deducted.

During this quiz it is prohibited to:

1. exchange information with any other person in any way, including by talking or exchanging papers or books;
2. use any electronic aid, including calculators;
3. use any books or notes;
4. leave the classroom before you complete and turn in your quiz.

I have read and understand all of the instructions above. On my honor, I pledge that I will not violate the provisions of the NJIT Academic Honor Code.

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Signature and Date

1. Let  $\Sigma = \{a, b\}$ . For any string  $w \in \Sigma^*$ , let  $n_b(w)$  denote the number of  $b$ 's in  $w$ . For example,  $n_b(ababb) = 3$ . Define the language  $A = \{ w \in \Sigma^* \mid n_b(w) \bmod 3 = 2 \}$ .

(a) List the first 6 strings in  $A^*$  in lexicographic order.

(b) Is  $A$  closed under concatenation? If so, give a proof. If not, give a counterexample with an explanation.

(c) Draw a DFA for  $A$ . You only need to draw the picture. You do not need to give the formal definition of your DFA as a 5-tuple.