

**Theory of Computation, CSCI 438, Spring 2022**  
**Essay questions for the final, May 5<sup>th</sup>, 3-5pm (6pm if needed)**  
**Due at the beginning of the exam.**

Answer the following with as many, or as few, words as is needed to thoroughly answer the question. You may use your notes, text or the Internet to answer these questions. You may not discuss these questions with any other students.

1. A friend of yours has heard that the acceptance problem for Turing machines is not decidable. Explain to your friend:
  - What is meant by acceptance problems.
  - That many acceptance problems are decidable.
  - How the acceptance problem for Turing machines is different than the other acceptance problems.
  - Why the acceptance problem for TMs cannot be decidable.

(5 pts.)

2. Your friend remembers that, when reading a science fiction book, a universal Turing machine was mentioned. Explain what a universal Turing machine is. (5 pts.)