

COT 4210 Homework #4: Sections 3.1

Assigned: 2/25/2021

Due Date/Time: On Webcourses

1) Give the sequence of configurations that the Turing machine M_2 in chapter 3 of the text (and shown in class) goes through while reading in the three following strings:

- a) 000
- b) 0000
- c) 000000

2) What is the flaw in the following proof to show that if a language L is Turing recognizable, then we can create an enumerator to enumerate it? Remember that the sequence s_1, s_2, s_3, \dots , is an enumerated list of all strings in Σ^* , from shortest to longest, in lexicographical order for all strings of the same length.

Let M be a Turing machine that recognizes L .

We can create an enumerator E for L as follows:

- 1. Repeat the following for $i = 1, 2, 3, \dots$
- 2. Run M on s_i .
- 3. If it accepts, print out s_i .

3) A Turing machines with a stay option is similar to an ordinary Turing machine except that the transition function has the form:

$$\delta: Q \times \Gamma \rightarrow Q \times \Gamma \times \{L, R, S\}$$

If $\delta(q, a) = (r, b, S)$, when the machine is in state q reading an a , the machine's head stays exactly where it is. Show that Turing machines with a stay option recognize the class of Turing-recognizable languages.

4) Show that Turing-decidable languages are closed under the following operations:

- a) union
- b) intersection
- c) complementation
- d) concatenation