Theory of Computation, Fall 2021
Assignment 6 (Due November 26 Friday 9:35am)

Q1. Are the following statement true or false? Briefly explain your answer.

(a) Every Turing machine semidecides some language. yes

(b) Every Turing machine decides some language. No, a counterexample

No. a counterexample Every Turing machine computes a function.

Q2. Let M be a Turing machine that decides some language. What does $L(M)$ look like? (Recall that $L(M)$ is the language semidecided by M.)

Q3. Let G be a context-free grammar. Consider the following problem.

Given a string w, does G generate w? L(G)

Express this problem as a language, and design a TM that decides this language (You may use any Turing machine we presented in the class as a subroutine). What conclusion can you draw from this problem? run M_{C1} on G Every CFL can be decided by some Turing Machine

Q4. [1, Exercise 4.2] Express the following problem as a language and show that it is recursive. (Hint: in class we gave a Turing machine that can decide whether two given DFAs accept the same language. You may use this Turing machine in your answer.)

Given a DFA M and a regular expression R, is $L(M) = L(R)$? "M""R"

1. construct a DFA accepting L(R)
2. Run ... on ...

References

[1] Sipser M.. Introduction to the Theory of Computation. CENGAGE Learning (2013)

[2] Lewis H., Papadimitriou C.. Elements of the Theory of Computation. Prentice-Gall (1998)