

COT 4210 Quiz #2: Turing Machine Introduction

Directions: Please answer each question on your own paper. Write your name on the top right corner of each sheet of paper you use. Clearly mark your answers and include justifications as needed. Staple your paper in the top left corner and turn your answers in. Keep this sheet for reference.

1) (5 pts) Determine if each of the following statements about the formal definition of a Turing Machine are true or false. (On your paper, clearly label part a, part b, etc. and following with the word True or False, fully spelled out in print – no cursive.)

a) Σ always contains the blank symbol, \sqcup .

b) Turing Machines can have more than one accept state.

c) Turing Machines must have exactly one reject state.

d) After a transition, if the tape head starts somewhere other than the left end of the tape, the tape head must move left or right.

e) An output does not have to be defined in the transition function for every distinct combination of input state and tape alphabet character.

2) (10 pts) Describe, at a high level, how to construct an enumerator for the prime numbers. Will your enumerator repeat values?

3) (10 pts) Prove that the following language is decidable. You may assume that the reader is familiar with any algorithm taught in CS2. No need to prove the correctness of any of the algorithms in CS2, but you must carefully describe how to use the output of any algorithm you use in detail in your description of showing that the language below is decidable.

$\text{GIRTH}_k = \{ (G, k) \mid G \text{ is an undirected weighted graph such that the distance between any two vertices in } G \text{ is less than or equal to } k. \}$