CPSC 421/501 101 2020W Final Exam, Part 1

[redacted]

TOTAL POINTS

23.5 / 28

QUESTION 1

1 Question 1 5 / 8

- **0 pts** Correct
- **2 pts** Part a incorrect
- **2 pts** Part b incorrect
- ✓ **- 2 pts** **Part c incorrect**
- **2 pts** Part d incorrect
- **1 pts** Part a partially correct
- ✓ **- 1 pts** **Part b partially correct**
- **1 pts** Part c partially correct
- **1 pts** Part d partially correct

QUESTION 2

2 Question 2 9 / 10

- **0 pts** Correct
- ✓ **- 1 pts** **No indication of the worktape initial content**
- **1 pts** No indication of tape alphabet
- **3 pts** Incorrect/Non-existent explanation
- **1 pts** Missing some rejection conditions in their transition function
- **1 pts** transition function does not account for the tape beginning (case were input has length less than 3). [This is lenient given the technical error, but rewards the student for thinking of a different than DFA-style approach.]
- **1 pts** Incomplete explanation (description is just $$\delta$$ in words)
- **1 pts** Empty string case is not handled
- **0.5 pts** Minor mistake in state diagram
- **2 pts** Treats accept/reject state the same as in DFAs
- **3 pts** Missing state diagram ($$\delta$$)
- **10 pts** incorrect

QUESTION 3

3 Question 3 9.5 / 10

- **0 pts** Correct
- **2 pts** No argument given to show that L is in NP.
- **0.25 pts** To show that L is in NP, you are not iterating through all I; you are non-deterministically writing down I.
- **0.5 pts** In proving L is in NP, you have not addressed the necessary condition that one of the m_i is divisible by 4.
- **0.25 pts** Argument that L is in NP is vague about what is checked about the subset I of [s].
- **2 pts** Argument that L is in NP must involve non-deterministic choices or a verifier that gives an I in [s].
- **0 pts** Argument that L is in NP is vague about the term "certificate" -- it should be a subset of [s].
- **8 pts** No reduction given; you have specify a function f of a SUBSET-SET (or some other NP-complete problem) instance which returns an instance of L.
- **7 pts** Your choice of a function f of a SUBSET-SET instance to an instance of L will not work in either of both requirements: (1) w in SUBSET-SUM implies f(w) in L, and (2) w not in SUBSET-SUM implies f(w) not in L.
- **6 pts** You need to specify a function f of a SUBSET-SET instance to an instance of L; it is not clear what is f.
- **4 pts** Reduction is going the wrong way: you need to reduce SUBSET-SUM (or some other NP-complete problem) to L, rather than reduce L to some NP-complete language.
- **4 pts** A reduction, f, from, SUBSET-SET to L is given, but the proof that w in SUBSET-SET iff f(w) in L has serious omissions/errors.
- **4 pts** Some idea of a reduction, f, from, SUBSET-

SET to L is given, but the proof that w in SUBSET-SET iff f(w) in L has serious omissions.

- 3 pts For f to be a reduction from L1 to L2 you must have that IF w IS NOT IN L1, THEN f(w) IS NOT IN L2. This reduction allows for the possibility that w is not in L1, but that f(w) is nonetheless in L2.

- 1.5 pts For f to be a reduction from L1 to L2 you must have that IF w IS NOT IN L1, THEN f(w) IS NOT IN L2. You prove only that if w is in L1 then f(2) is in L2, but not conversely.

- 2 pts Your reduction doesn't correctly address the condition that one of the m_i with i in I must be divisible by 4.

- 1 pts Your reduction doesn't correctly address the condition that one of the m_i in I must be divisible by 4; the m_i are supposed to be positive integers, not 0.

- 2 pts The instances of L must have positive integers.

- 0.5 pts The instances of L must be positive integers, but this isn't the most serious problem.

- 1 pts A subset sum question x_1,...,x_k,t does not have to have t written as u - 2020; you seem to want to set u = 2020+t.

- 5 pts The argument that w in SUBSET-SUM iff f(w) in L not given.

- 0.5 Point adjustment

This works if you replace 4(t) in your construction parts 1 and 3 with 4 B where B is large (e.g., the sum of all the n_1,...,n_k). But taking B = t may be too small if, for example, n_1 = t + 2020 + 4t...