2202 COL 352 Quiz 3

CHINMAY MITTAL

TOTAL POINTS

10 / 10

QUESTION 1

1 Unary undecidable 4/4

- + 0 pts Incorrect/Not Attempted
- √ + 1 pts Statement is True
- √ + 3 pts Correct Proof
 - + 2 pts Partially correct proof

QUESTION 2

2 Unary PCP 6/6

- √ + 6 pts Correct
 - + 0 pts Incorrect
 - + 3 pts Partially Correct
 - + 1 pts Decidable

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Roll No: 2020 CS 1033 6

(COL 352) Introduction to Automata and Theory of Computation

April 19, 2023

Quiz 3

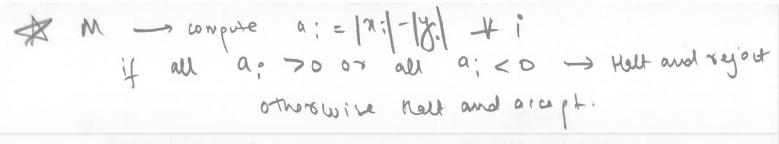
Duration: 40 minutes

Orderidede.

(10 points)

Beware: Be clear in your writing. If you use a statement proved in class or in the problem set, then write down the entire statement before using it. You will not get a new sheet, so make sure you are certain when you write something (maybe use a dark pencil). Make a judicious decision of which tool(s) to use to get a clean and short answer that fits in the space. If you cheat, you will surely get an F in this course.

1. (4 points) Prove or disprove: There exists a unary language (i.e., $L \subseteq \{1\}^*$) which is undecidable. Consider the set of all wrang stong = 219. Meadly, This set Countable infinite. We can nake an sonjection from MU 209 (map on to story with or is The set of all uneray Languages A = & L | L = & y" 2,4" and as shown in class - It has the Cardinality as the set of Real Numbers K. M = Settis | m is a Torig nomine decider for a viery androbox over 812 1 clearly IMI = IMI since M is a subset hence is countable. (20,14" is countable) acety |M | < |A | < |IR | = |A1 Mence no surjective mapping exists M to => there exists a many language I for which there is no trong Madine dociders. and thence there exists a many language



2. (6 points) Recall the Post Correspondence problem (PCP): You are given as input, a set of pairs of strings P = $\{(x_1,y_1),\ldots,(x_n,y_n)\}$ over the alphabet $\Sigma=\{0,1\}$. You are required to decide if there exists a finite sequence $(i_1, i_2, \dots, i_m) \in \{1, 2, \dots, n\}^m$ such that $x_{i_1} \dots x_{i_m} = y_{i_1} \dots y_{i_m}$ (we stated the problem a little differently in class, but these two formulations are equivalent). Prove or disprove: Unary PCP (i.e., PCP where $\Sigma = \{1\}$) is

This problem can be napped to a similar problem (the key idea being that since there is only one letter in the alphabet the ordering in the match doesn't matter for each i, we compute my - ly it = a: (extrem 18 numerator stone The problem is equivalent to finding of & M. has compared USOY to the ≥ d; a; = 0 - (1 Such that - Some orders of dominous does not matter we always keep all the dominous of type (a, y,) first then all of (h, y, + match corresponds to an equal numbers of one's ain the numeroator on ... and denominators which is equivalent to equation (1) =>YES any a; = 0 we can keep x; = 1 and y; = 0 for j + i all a: < n the if all a; <0 then no metal exist >NO (all 9; need to be o Which is not possible remaining case is when one a: <0 and one and otherwise egris < 0 >0 crists (others can be it this lase a match always exists 101 x: = /ai/ md x:= 10%, others are zero () Z Ka; = a.a. - a; a, Hence the PCPU docidable by the following I'm which implements

A (Ton top)

the above algorithm