UNID   Name:

CS 3100 – Final Exam (mock) – TOTAL 100 points
PART-1 : **CLOSED BOOK** – 40 mins and 40 points
5 min break
PART-2 : **OPEN BOOK** – 60 mins and 60 points

The multiple choice problems given here can earn you positive points (correct answer) or and negative points (incorrect). We show it as [**+m/-n**]. You must write a compact two-sentence (approx.) explanation in support of your answer, without which you won't gain any points. **You must put a check mark ($\sqrt{}$) in one of the squares associated with each question.**

PART-1 is similar to that of Midterm-2; just giving more practice below

1. [**+5/-1**] **Choose from various answers below.**

    A. A DFA reads its input fully before accepting a string

    B. A multi-tape TM is equivalent to a single tape TM

    C. A DTM may accept a string without reading its input

    D. The number of configurations of an LBA is fixed by its number of states Q

    ☐ All these assertions are true.

    ☐ Assertions A, B, and C are true.

    ☐ Assertion A and C alone are true.

    ☐ Assertions A and D are true.

    Explanation:

2. [**+5/-1**] **Choose from various answers below.** The Schröder-Bernstein Theorem

    A. helps establish a bijection between two sets A and B by finding two one-to-one onto functions $f : A \rightarrow B$ and $g : B \rightarrow A$.

    B. ... by finding two one-to-one into functions $f : A \rightarrow B$ and $g : B \rightarrow A$.

    C. was used in class to show that the number of C programs is countably large.

    D. is another way to present the Diagonalization proof.

    ☐ None of these assertions are true.

    ☐ Assertion A alone is true.

    ☐ All assertions except A are true.

    ☐ Assertions B and C alone are true.

    Explanation:

3. [**+5/-1**] Consider these assertions.

      A. CFLs are closed under intersection.

      B. RE languages are closed under intersection.

      C. RE languages are closed under complementation.

      D. Either a language L is RE or its complement $\overline{L}$ is RE.

☐ All of these assertions are true.

☐ Assertion B alone is true.

☐ All assertions except A are true.

☐ Assertions B and D alone are true.

Explanation:

4. [**+5/-1**] Consider the Pumping Lemma proofs discussed in this course; call them RPL and CPL for the regular and context-free Pumping lemmas. Recall that the main parts of these PLs are as follows: (i) in RPL, a string $uvw \in L \Rightarrow \forall i : uv^iw \in L$. (ii) in CPL, a string $uvwxy \in L \Rightarrow \forall i : uv^iwx^iy \in L$. Now consider the assertions.

      A. In RPL, $v \neq \varepsilon$ because the language L is not empty

      B. In CPL, $vx \neq \varepsilon$ because the grammar of L is assumed to be unambiguous

      C. In RPL, $v \neq \varepsilon$ because the loop in the DFA has a length of at least 1

      D. In CPL, $vx \neq \varepsilon$ because the grammar of L is assumed to be in the Chomsky Normal form.

☐ Assertions A, B, and C are true

☐ Assertions C and D are true

☐ Assertion C alone is true

☐ Assertions A, C, and D are true

Explanation:

PART-2 will be similar to that of Midterm-2