Assignment 2

CU2102 CG1103 Theory of Computation

Due: 06/09/2025, 23:59 Maximum Marks: 30

1. Are the following subsets of $\{a, b, \$\}^*$ recognizable? Justify. [1]

$$\{xy \mid x, y \in \{a, b\}^*, |x|_a = |y|_b\}$$

$$\{x\$y \mid x, y \in \{a, b\}^*, |x|_a = |y|_b\}$$

2. Let A be a DFA with n states. Is the following statement *true*? Substantiate.

   If A accepts all the words whose length is between n and $2n$, then $L(A) = \Sigma^*$. In other words, if $\{w \mid n \leq |w| \leq 2n\} \subseteq L(A)$, then $L(A) = \Sigma^*$.

3. Consider the grammar G below for if-then-else statements.

$$G = (\{S, C\}, \{i, t, e, c, s\}, P, S)$$

   where the set of productions P is:

$$S \to iCtSeS \mid iCtS \mid s$$
$$C \to c$$

   (a) Argue that G is ambiguous.

   (b) Give an unambiguous grammar for $L(G)$?

[1] $|x|_a$ denotes the number of 'a's in the word x.