TUTORIAL – 1B

(NON-REGULAR LANGUAGES)

Problem-1

Use Pumping Lemma to Prove that the following language is non-regular:

$$L_1 = \{ a^{k^3} \mid k \geq 0 \}$$

Problem-2

Use Pumping Lemma to Prove that the following language is non-regular:

$$L_2 = \{ a^{n!} \mid n \geq 0 \}$$

Problem-3

Use Pumping Lemma to Prove that the following language is non-regular:

$$L_3 = \{ a^p \mid p \text{ is a prime} \}$$

Problem-4

Use Pumping Lemma to Prove that the following language is non-regular:

$$L_4 = \left\{ a^i b^j a^{ij} \middle| \, i, j \geq 0 \right\}$$

Problem-5

Determine regularity / non-regularity of the following languages:

$$L_{5a} = \{ x \in \{a, b\}^* \mid \#a(x) - \#b(x) = 2026 \}$$

$$L_{5b} = \{ x \in \{a, b\}^* \mid \#a(x) - \#b(x) \text{ is a multiple of } 2026 \}$$

where $\#a(x)$ and $\#b(x)$ denote the number of a's and b's in string x.

THANK YOU !