Problem

Consider the function $pad: \Sigma^* \times \mathcal{N} \longrightarrow \Sigma^*\#^*$ define the language pad(A, f) as

$$pad(A, f) = \{pad(s, f(m)) | \text{ where } s \in A \text{ and } m \text{ is the length of } s\}.$$

$$\text{Prove that if } A \in \text{TIME}(n^6)\text{, then } pad(A, n^2) \in \text{TIME}(n^3).$$

Step-by-step solution

Step 1 of 1

For any function $f : N \to N$ and language, $pad(A, f)$ is defined as:

$pad(\text{A}, f) = \{pad(s, f(m)) | \text{ where } s \in \text{A and m is the length of } s\}$.

If $\text{A} \in \text{TIME}(n^6)$ is given then, it is supposed that M be a machine that decide A in time n^6.

• Now a machine M’ can be considered for $pad(A, n^2)$ that on input x, check if x is of the format $pad(w, |w|^2)$ for some string $w \in \sum^*$. Input x will be rejected if it will not matched. Otherwise, simulate M on w.

• The running time of machine M’ is $O(|x|^3) + O(|w|^6) = O(|x|^3)$.

Hence, it can be said that $pad(\text{A}, n^2) \in \text{TIME}(n^3)$.

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