IITM-CS2200 : Languages, Machines and Computation
Tutorial \#2

1. Show that the following languages are not regular.
(a) $L=\left\{x \in\{0,1\}^{*}:\right.$ Number of 0 s and 1 s in $x$ are the same $\}$
(b) $L=\left\{0^{k}: k\right.$ is a composite number $\}$
(c) $L=\left\{a^{m} b^{n}: \operatorname{gcd}(m, n)=1\right\}$
2. Let $L$ be a language consisting of all strings $x \in\{0,1\}^{*}$ such that the number of ' 01 ' and ' 10 ' in $x$ are the same. This is counting overlapping appearances. (Eg : 010 is in the language but 0101 is not in the language). Is $L$ regular. Consider the variant of the language $L^{\prime}$ with the same definition, where we do not count overlapping appearances. Is $L^{\prime}$ regular?
