Correction to Solution to Problem Set 2

2.3 The given context-free grammar $G$ is

\[
\begin{align*}
R &\rightarrow XR X | S \\
S &\rightarrow a T b | b T a \\
T &\rightarrow X T X | X | \epsilon \\
X &\rightarrow a | b \\
\end{align*}
\]

k. $T \Rightarrow^* XXX$: true.

2.7 a). The language of strings over the alphabet \( \{a, b\} \) with twice as many $a$’s as $b$’s.

Remark 1 The only correction from the previously posted solution is the addition of a transition from state $q_3$ to $q_6$ with label $\epsilon, \$ \rightarrow \$.

Figure 1: 2.7 (a)

2.13 Given the grammar $G$:

\[
\begin{align*}
S &\rightarrow T T | U \\
T &\rightarrow 0 T | T 0 | \# \\
U &\rightarrow 0 U 0 0 | \# \\
\end{align*}
\]

a). The language generated by $L = L(G)$ is the set of strings that either are composed by the concatenation of 3 arbitrary-length strings of zeroes (delimited by the symbol $\#$) or strings of the form $0^k \# 0^{2k}$ for $k \geq 0$. More formally, a word $w$ in $L$ is of the form $w = 0^{k_1} \# 0^{k_2} \# 0^{k_3}$ (where $k_1, k_2, k_3 \geq 0$) or of the form $w = 0^k \# 0^{2k}$ for $k \geq 0$. 