Austin Corteville | Principles of Prog | HW2-CFG

1)

$S \rightarrow 0S0 \mid X$
$X \rightarrow 1 \mid X0 \mid \varepsilon$

2) Impossible since there is no order given. While we are able to count the numbers of a's and b's, we can't account for all possible combination of $\Sigma\{a,b,c\}$ using a context free grammar.

3)

$S \rightarrow 0X0S \mid 1Y1S \mid X \mid Y \mid \varepsilon$
$Y \rightarrow 00Y \mid 010Y \mid 1 \mid 1010Y \mid \varepsilon$
$X \rightarrow 11X \mid 1010X \mid 0101Y \mid \varepsilon$

4)

$S \rightarrow -A$
$A \rightarrow N.J$
$N \rightarrow D \mid 0$
$J \rightarrow K \mid 0$
$D \rightarrow 1H \mid 2H \mid 3H \mid 4H \mid 5H \mid 6H \mid 7H \mid 8H \mid 9H \mid F$
$F \rightarrow 0 \mid 2 \mid 4 \mid 6 \mid 8$
$K \rightarrow 0K \mid 1K \mid 2K \mid 3K \mid 4K \mid 5K \mid 6K \mid 7K \mid 8K \mid 9K$
$M \rightarrow 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$