CSCI 340 − Homework 10

Professor Killian

Due: April 14, 2019 @ 11:59PM

1. Decide whether or not the following grammars generate any words. Show work! (2 points each)

    i

$$S \rightarrow aSa \mid bSb$$

    ii

$$S \rightarrow XY \mid SY$$
$$X \rightarrow SY \mid a$$
$$Y \rightarrow SX \mid b$$

    iii

$$S \rightarrow AB$$
$$A \rightarrow BC \mid b$$
$$B \rightarrow CD$$
$$C \rightarrow DA$$
$$D \rightarrow a$$

    iv

$$S \rightarrow XS$$
$$X \rightarrow YX \mid a$$
$$Y \rightarrow YY \mid XX$$

    v

$$S \rightarrow AB$$
$$A \rightarrow BSB \mid CC \mid a \mid b$$
$$B \rightarrow AAS \mid CC$$
$$C \rightarrow SS \mid b \mid bb$$

2. Decide whether or not the following grammars generate finite or infinite languages. Show work! (2 points each)

i
$$S \rightarrow XS \mid b$$
$$X \rightarrow YZ$$
$$Y \rightarrow ab$$
$$Z \rightarrow XY$$

ii
$$S \rightarrow XY \mid bb$$
$$X \rightarrow YX$$
$$Y \rightarrow XY \mid SS$$

iii
$$S \rightarrow XY$$
$$X \rightarrow AA \mid YY \mid b$$
$$A \rightarrow BC$$
$$B \rightarrow AC$$
$$C \rightarrow BA$$
$$Y \rightarrow a$$

iv
$$S \rightarrow XY$$
$$X \rightarrow AA \mid XY \mid b$$
$$A \rightarrow BC$$
$$B \rightarrow AC$$
$$C \rightarrow BA$$
$$Y \rightarrow a$$

v
$$S \rightarrow SS \mid b$$
$$X \rightarrow SS \mid SX \mid a$$

3. (5pt) Build a TM that accepts the language of all words that do not contain the substring bbb

4. (5pt) Build a TM that accepts $\{\, a^n b^{2n} \,\}$

5. (5pt) Trace *aabbaa* on the Turing Machine on Slide 11

6. (5pt) Trace *aabbaa* on the Turing Machine on Slide 7