1. Let \( L = \{ab, aa, baa\} \). Which of the following strings are in \( L^* \): \( abaabaaabaa, aaaaabaaa, baaaabaaaab, baaaabaa \)? Which strings are in \( L^4 \)?

2. Let \( \Sigma = \{a, b\} \) and \( L = \{aa, bb\} \). Use set notation to describe \( L \).

3. Are there languages for which \( L^* = (L^*)^* \)?

4. Give a simple description of the language generated by a grammar with the following productions:

\[
S \rightarrow aA,
A \rightarrow bS,
S \rightarrow \lambda.
\]

5. Let \( \Sigma = \{a, b\} \). Find a grammar to describe each of the following languages:

(a) \( L_1 = \{a^nb^m : n, m \geq 0\} \)
(b) \( L_2 = \{a^n b^{2n} : n \geq 0\} \)
(c) \( L_3 = \{a^n b^{n-3} : n \geq 3\} \)
(d) \( L_1 L_2 \)
(e) \( L_1 \cup L_2 \)
(f) \( L_1^* \)
(g) \( L_1^+ \)
(h) \( L_1 \setminus L_3 \).

6. Determine whether the grammar with production rule

\[
S \rightarrow aSb|ab|\lambda
\]

is equivalent to the grammar with production rules

\[
S \rightarrow aAb|ab,
A \rightarrow aAb|\lambda.
\]

7. For \( \Sigma = \{a, b\} \), construct DFA’s that accept strings consisting of

(a) all strings with exactly one \( a \)
(b) all strings with at least one \( a \)
(c) all strings with at most three a’s
(d) all strings with exactly two a’s and more than two b’s

8. Find DFA’s for the following languages on $\Sigma = \{a, b\}$,
   (a) $L = \{w : |w| \mod 3 = 0\}$
   (b) $L = \{w : n_a(w) \mod 3 > 1\}$
   (c) $L = \{w : |w| \mod 3 = 0, |w| \neq 6\}$