25 $S \to aSa \mid bSb \mid a \mid b \mid \lambda$ generates

$PAL = \{ w \in \{a,b\}^* \mid w = w^R \}$

i) $S \to \lambda$

ii) $S \to a$

iii) $S \to b$

iv) $S \to aSa \to aaa$

v) $S \to bSb \to bbb$

vi) $S \to aSa \to aba$

vii) $S \to bSb \to bab$

viii) $S \to aSa \to abSba \to ababa$

ix) $S \to aSa \to abSba \to abbba$

x) $S \to aSa \to abSba \to abba$

xi) $S \to bSb \to bbSbb \to bbbbb$

xii) $S \to bSb \to bbSbb \to bb\lambda bb \to bbbb$

xiii) $S \to bSb \to bbSbb \to bbabb$

xiv) $S \to bSb \to baSab \to ba\lambda ab \to baab$

xv) $S \to bSb \to baSab \to baaab$

xvi) $S \to bSb \to baSab \to babab$

xvii) $S \to aSa \to aaSaa \to aabaa$

xviii) $S \to aSa \to aaSaa \to aabSbaa \to aababaa$

xix) $S \to aSa \to aaSaa \to aaaSaaa \to aaaaaaa$

xx) $S \to aSa \to aaSaa \to aabSbaa \to aab\lambda baa \to aabbaa$

26 i) $S \to aS \mid bS \mid a$

$S \to a$

$S \to aS \to aa$

$S \to bS \to ba$

$S \to aS \to aaS \to aaa$

$S \to bS \to bbS \to bba$

$L(G) = \{a, aa, ba, aba, baa, \dots\}$

ii) $S \to aSa \mid bSb \mid aSb \mid \lambda$

$S \to \lambda$

$S \to aSa \to aa$

$S \to bSb \to bb$

$S \to aSb \to a\lambda b \to ab$

$S \to aSa \to abSba \to ab\lambda ba \to abba$

$S \to bSb \to baSab \to ba\lambda ab \to baab$

$S \to aSa \to aaSba \to aa\lambda ba \to aaba$

$S \to aSb \to aaSab \to aa\lambda ab \to aaab$

$L(G) = \{\lambda, aa, bb, ab, abba, baab, \dots\}$

iii) $S \to aAb \mid aBb \mid aSb$

$A \to aA \mid a$

$B \to bB \mid b$

$S \to aAb \to a$

$S \to aAb \to aaAb \to aaab$

$S \to aBb \to abb$

$S \to aBb \to abBb \to abbb$

$S \to aSb \to aaAbb \to aaabb$

$S \to aSb \to aaBbb \to aabbb$

$L(G) = \{a, aaab, abb, abbb, \dots\}$

$S \to aAb \to a\lambda b \to ab$

$S \to aAb \to aaAb \to aab$

$S \to aAb \to abAb \to ab\lambda b \to abb$

$S \to aAb \to aaAb \to aabAb \to aab\lambda b \to aabb$

$S \to aAb \to abAb \to abaAb \to aba\lambda b \to abab$

$S \to aAb \to aaAb \to aabAb \to aabbaAb \to aabba\lambda b \to aab$

$a(ab)^m b \mid m \geq 0$

ii) $S \to aSb \mid ab$

$S \to ab$

$S \to aSb \to aabb$

$a^n b^n \mid n > 0$

iii) $S \to aSc \mid aAc$

$A \to aAb \mid ab$

$S \to aAc \to aabc$

$S \to aAc \to aaAbc \to aaabbc$

$S \to aSc \to aaAcc \to aaabcc$

$S \to aSc \to aaAcc \to aaaAbcc \to aaaabbcc$

$a^n a^m b^m c^n \mid m > 0, n > 0$

$B \to bB \mid b$

$A \to aA \mid a$

$S \to AB \to aB \to ab$

$S \to AB \to aAB \to aAbB \to aabB \to aabb$

$S \to AB \to aB \to abB \to abb$

$a^m b^n \mid m > 0, n > 0$

28) $L(G) = a^n b^m \mid n \geq m$

$S \to AB$

$A \to aA \mid a$

$B \to bB \mid b$

29) $S \to aS \mid bS \mid a \mid b$

i) babbaa

$S \to bS \to baS \to babS \to babbS \to babbaS \to babbaa$

ii) ba bababa

$S \to bS \to baS \to babS \to babaS \to bababS \to bababaS \to bababaS$

$\to bababaa$

iii) aaabaa

$S \to aS \to aaS \to aaaS \to aaabS \to aaabaS \to aaabaa$

$S \to bS \to baS \to baaS \to baabS \to baabaS \to baabaaS \to baabaaS \to baabaaa$

30) i) $w \in \{a,b\} \mid |w| \bmod 2 = 0$

$S \to aSb \mid aSa \mid bSb \mid ab \mid \epsilon$

ii) $w \in \{a,b\} \mid |w| \bmod 2 = 1$

$S \to aSb \mid aSa \mid bSb \mid a \mid b$

iii) $w \in \{a,b\} \mid |w| \bmod 3 = 0$

iv) $w \in \{a,b\} \mid |w| \bmod 3 = 2$

iv) all strings with the same power

v) each string is starting and ending with the same symbol