Question 1 (5 points)

Given the following languages:

$$L_1 = \{xax \ : \ x \in \{a,b\}^*\}$$
$$L_2 = \{x \in \{a,b\}^* \ : \ |x|_b = 1\}$$

(a) (1.25 points) Enumerate the first seven words in canonical order of L_1.

$a, aaa, bab, aaaaa, abaab, baaba, bbabb$

(b) (1.25 points) Describe the language L_2^2.

$L_2^2 = \{x \in \{a,b\}^* \ : \ |x|_b = 2\}$.

(c) (1.25 points) Describe the language $L_2 L_2^r$.

Note that $L_2 = L_2^r$, therefore, $L_2 L_2^r = \{x \in \{a,b\}^* \ : \ |x|_b = 2\}$.

(d) (1.25 points) Describe the language $(bb)^{-1}L_1$.

$(bb)^{-1}L_1 = \{xabbx \ : \ x \in \{a,b\}^*\}$.

Question 2 (5 points)

Obtain a deterministic finite automaton for the language:

$$L = \{xaaby \ : \ x, y \in \{a,b\}^* \wedge aab \notin Seg(x) \wedge bb \notin Seg(y)\}$$