UNIVERSITE LIBANAISE
FACULTE DES SCIENCES
BRANCHE: 3

الجامعة اللبنانية
كلية العلوم
الفرع الثالث

Course : I3307	**Date : July 2021**
Session : Final	**Duration : 1h30**

Exercise 1 (20 points)
Let L and R be two languages over some alphabet Σ. For what condition on L, we have

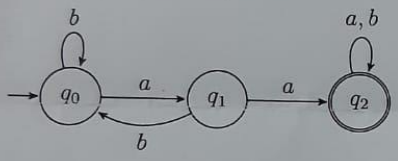
a) $L^+ = L^*$

b) $LR = R, \forall R$

c) $LR = \phi, \forall R$

d) $L = L^*$

Exercise 2 (20 points)
Consider the following DFA:



a) Give two strings accepted by this DFA and two strings non accepted.

b) Give the corresponding transition table.

c) Describe the accepted language.

Consider the language $L = \{w \in \{a,b\}^* : w = xux$ où $x \in \{a,b\}$ and $u \in (\{a,b\} - \{x\})^*\}$

d) Give two strings in the language and two not in the language.

e) Give a DFA accepting the language L.

Exercise 3 (20 points)
Give DFAs for the following languages:

a) $L_1 = \{w \in \{a,b\}^* : |w|\%3 = 1\}$.

b) $L_2 =$ complément de L_1.

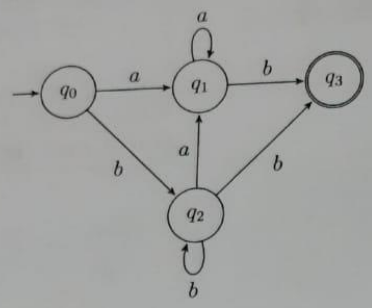
c) $L_3 = \{w \in \{a,b\}^* : w$ se termine par $ab\}$.

d) $L_4 = \{w \in \{a,b,c\}^* : abc$ est un sous-mot de $w\}$.

Choose one from the following two exercises

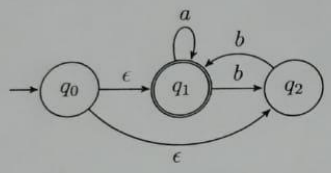
Exercise 4 (40 points)

a) Consider the following NFA:



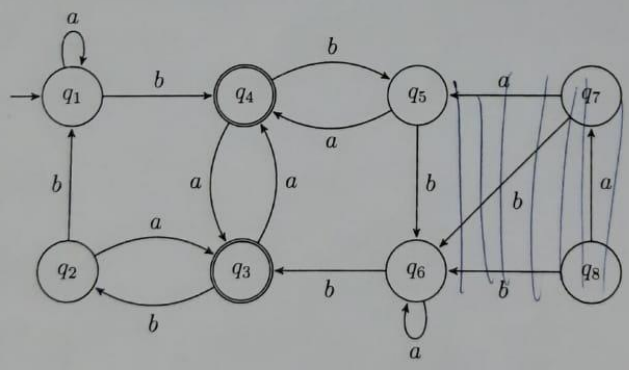
Give the corresponding DFA using the subset construction method.

b) Consider the following l'ϵ−NFA:



Give the corresponding NFA by eliminating ε transition.

c) Consider the following DFA:



Give the corresponding minimal DFA.

Exercise 5 (40 points)

Let L, R and S be languages over some alphabet Σ. Prove that

a) $L^*L^* = L^*$

b) $L(R \cap S) \subset (LR \cap LS)$ and $(LR \cap LS) \not\subset L(R \cap S)$

c) $(R \cap S)^* \subset (R^* \cap S^*)$ and $(R^* \cap S^*) \not\subset (R \cap S)^*$