## *Supervised Work 2: Finite State Automata*

### ***Exercise 1***

Let A = ({$e_0$,$e_1$,$e_2$,$e_3$,$e_4$},{a,b},δ,$e_0$,{$e_2$}). δ is represented by the following transition table :

| | ***A*** | ***b*** |
|---|---|---|
| → $e_0$ | $e_1$ | $e_4$ |
| $e_1$ | $e_4$ | $e_2$ |
| * $e_2$ | $e_3$ | $e_4$ |
| $e_3$ | $e_4$ | $e_2$ |
| $e_4$ | $e_4$ | $e_4$ |

1) Provide the transition diagram of the automata.
2) What is the role of e4?
3) Provide a simplified diagram (prune the automata).

### ***Exercise 2***

Let the automata be A = (X, S, q0, F, I) with X = {0, 1}, S = {q0, q1, q2, q3}, F = {q2}, and I = {(q0, 0, q0), (q0, 0, q1), (q1, 0, q2), (q2, 0, q3), (q2, 1, q3), (q3, 1, q1)}.

1. Provide the graphical representation of the automata.
2. Provide the matrix representation of the automata.
3. Are the following words recognized by this automata: 00, 0000, 100, 001, 000110, 010, ε?

### ***Exercise 3***

Find finite state automata that recognize the following languages:

• L1 ={ε,a,ab}.

• L2 = words with length 2

• L3={$a^ib^jc^{2k}$,k,i ≥0,j > 1}.

• L4 = L'ensemble des mots ayant au moins 3 zéros consécutifs ;

• L5 = L'ensemble des mots qui finissent ou commencent par 01

### ***Exercise 4***

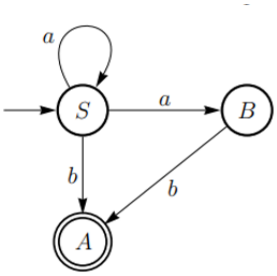
For each of the following languages, construct the finite state automata that recognizes it:

L1 = {w∈{a,b,c}* ends with $a^3$ou $b^2$}

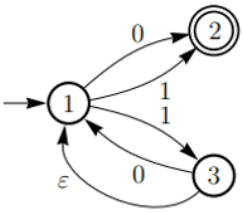
L2 = {w∈{0,1}* / w divisible by 3}

***Exercise 5***

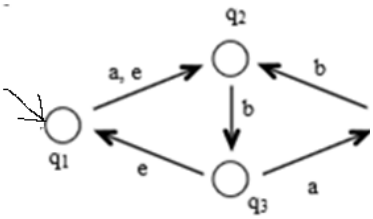
Make the following three automata deterministic




A



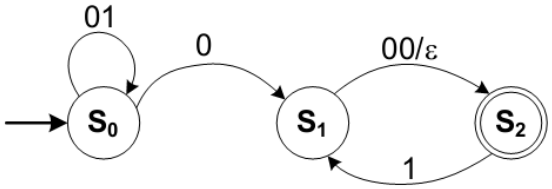

B




C

***Exercise 6***

Let A be the following finite state automata:




1. Find the simple deterministic finite automata B such that L(B)= L(A)
2. Find the complement finite state automata such that L(C)= L(B)

***Exercise 7***

Let the generalized finite automata (GFA) A1 be defined as follows:
A1 = (X, Q, I, F, δ) such that:
X = {a, b}, Q = {q0, q1, q2}, I = q0, F = {q0}, and δ(q0, aa) = q0, δ(q0, ε) = q1, δ(q1, b) = q1, δ(q1, b) = q2, δ(q2, ε) = q0.

1. Find the equivalent simple and deterministic finite automata (DFA) for A1.
2. Find a regular grammar that generates the language recognized by A1.