CS323 Assignment1 Answer

Exercise 1

- Yes.
- Yes.
- $5 + 4 + 3 + 2 = 14$
- $2^5 = 32$
- No.

Exercise 2

ϵ, abc, def, $abcdef$, $defabc$, $abcdefabc$, $defabcdef$, $abcdefabcdef$

Exercise 3

ϵ, e, de, cde, $bcde$, $abcde$

Exercise 4

regular definition: $valid \rightarrow [0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5]$

regular definition for a valid IPv4 address: $valid.\ valid.\ valid.\ valid$

Exercise 5

Yes.

$L_1 = L((ab)^*ac) = \{(ab)^nac | n \geq 0\}$

$L_2 = L(a(ba)^*c) = \{a(ba)^nc | n \geq 0\}$

We aim to prove that for all $n \geq 0$, the following equation holds:

$(ab)^nac = a(ba)^nc$

Mathematical induction:

Base case:

For $n = 0$:

$(ab)^0ac = ac = a(ba)^0c$

Inductive Hypothesis:

Assume that for some $i \geq 0$, the statement holds. That is, we assume:

$(ab)^iac = a(ba)^ic$

Inductive Step:

$(ab)^{i+1}ac = ab(ab)^iac = aba(ba)^ic = a(ba)^{i+1}c$

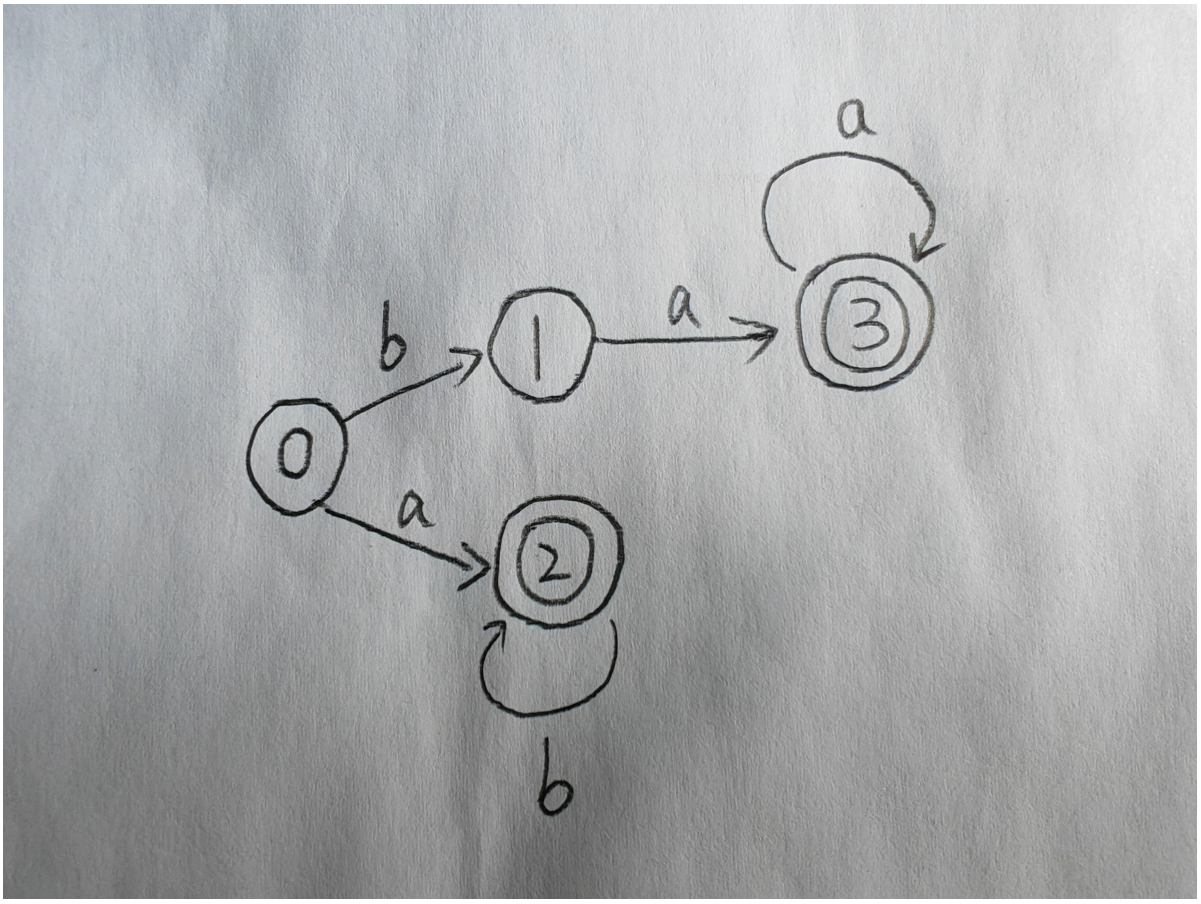
By the principle of mathematical induction, since the base case holds and the inductive step has been proven, we conclude that for all $n \geq 0$:

$(ab)^n ac = a(ba)^n c$

Therefore, the two regular languages L_1 and L_2 are equivalent.

Exercise 6

state transition diagram:



No.