

# ***COS4014-B Maths for Computing Coursework***

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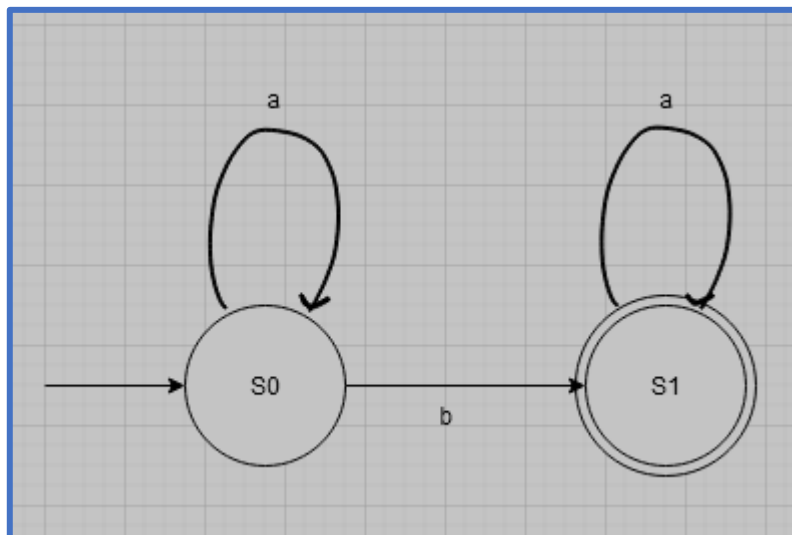
***UB Number: 23011124***

**Q1) L1 which has exactly one b but any number of as.**

*REGULAR EXPRESSION:*

$a^*ba^*$

*FSA:*



*TESTS:*

In the language

**aaba** – (S0, a, S0, a, S0, b, S1, a, S1)

Not in the language

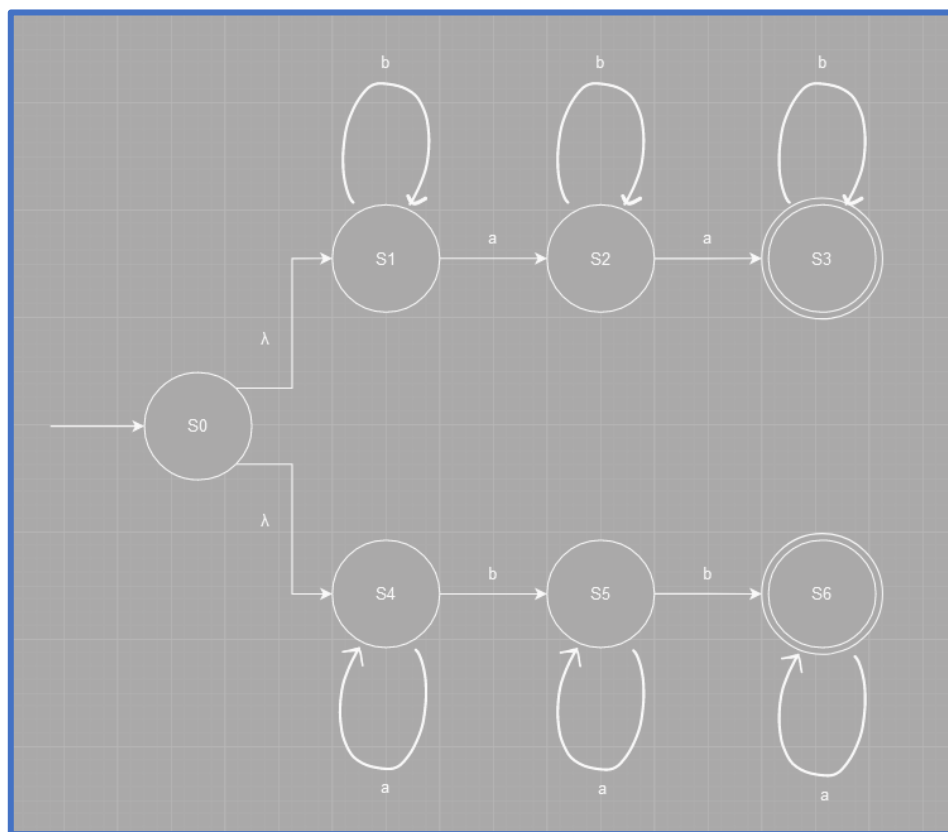
**baabaa** – (S0, b, S1, a, S1, a, S1, b, error...)

**Q2) L3 which contains exactly two as or exactly two bs, although not necessarily adjacent.**

REGULAR EXPRESSION:

$$b^*ab^*ab^* + a^*ba^*ba^*$$

FSA:



TESTS:

In the language

**bbbaba** – (S0,  $\lambda$ , S1, b, S1, b, S1, b, S1, a, S2, b, S2, a, S3)

Not in the language

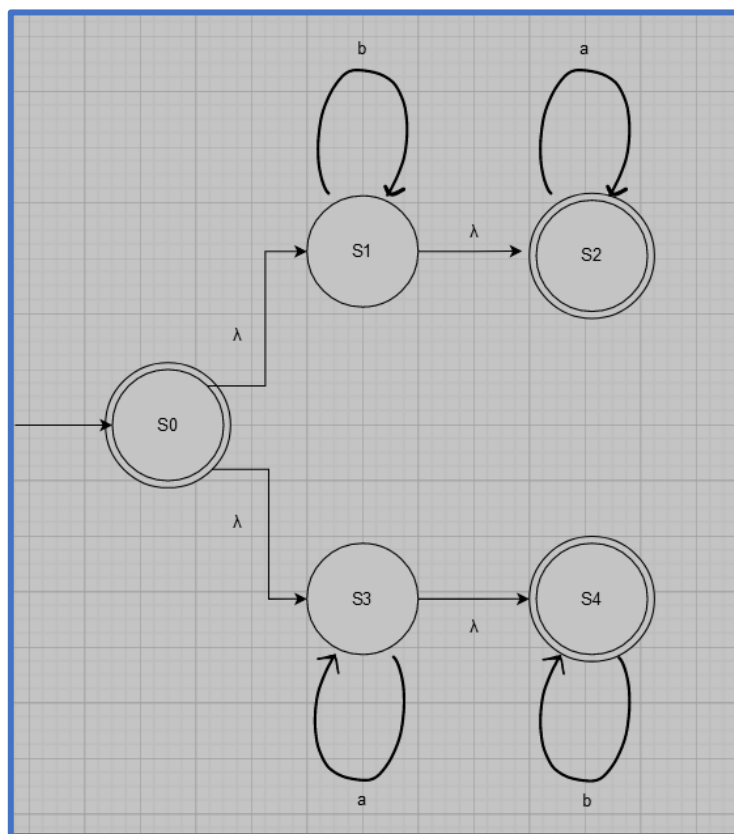
**abbbbaaba** – (S0,  $\lambda$ , S4, a, S4, b, S5, b, S6, b, error...)

**Q3) L4 which has all the bs appearing before any of the as,  
or all the as appearing before any of the bs.**

REGULAR EXPRESSION:

$b^*a^* + a^*b^*$

FSA:



TESTS:

[In the language](#)

**bbbbaaa** – (S0, λ, S1, b, S1, b, S1, b, S1, b, S1, λ, S2, a, S2, a, S2, a, S2)

[Not in the language](#)

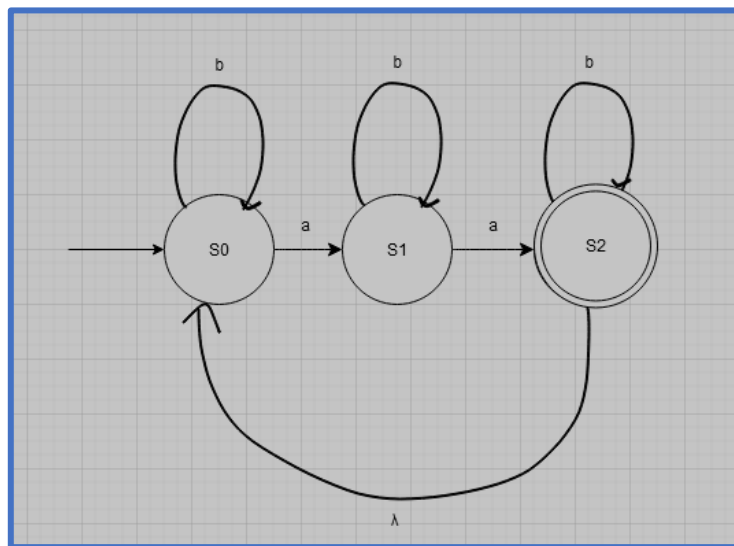
**aabba** – (S0, λ, S3, a, S3, a, S3, λ, S4, b, S4, b, S4, error...)

**Q4) L5 where there can be any number of bs but the number of as must be even, although the as do not have to be adjacent.**

REGULAR EXPRESSION:

$(b^*ab^*ab^*)^*$

FSA:



TESTS:

[In the language](#)

**babbbbaaba** – (S0, b, S0, a, S1, b, S1, b, S1, b, S1, a, S2, λ, S0, a, S1, b, S1, a, S2)

[Not in the language](#)

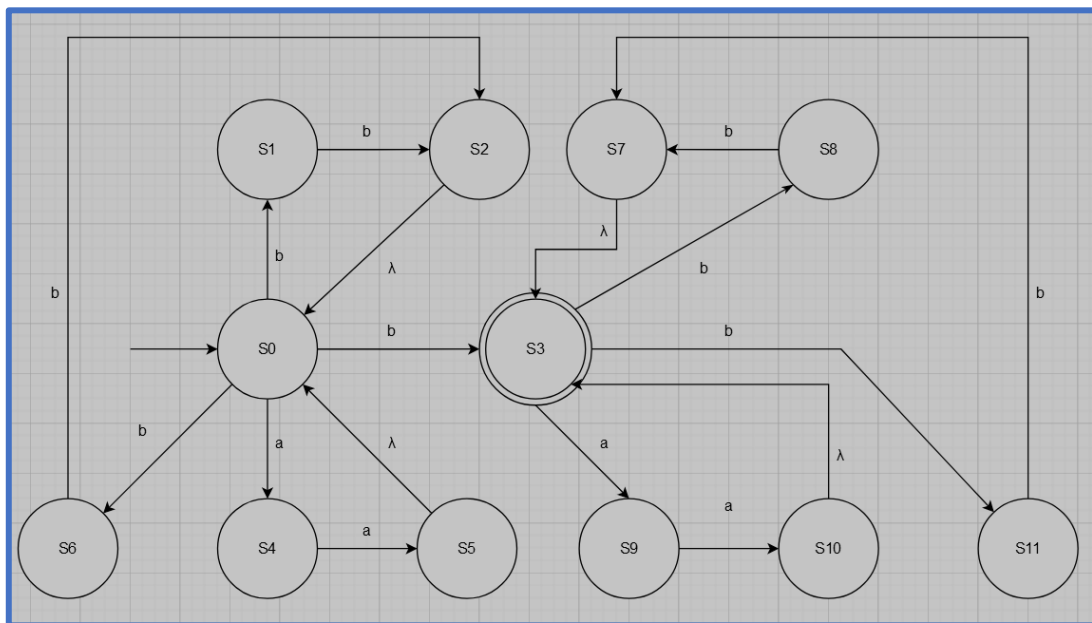
**aabba** – (S0, a, S1, a, S2, b, S2, b, S2, a, error...)

**Q5) L2 which has an odd number of bs and an even number of as.**

REGULAR EXPRESSION:

$(bb)^*(aa)^*(bb)^*b(bb)^*(aa)^*(bb)^*$

FSA:



TESTS:

In the language

**bbaabbbbaabbbbb** – (S0, b, S1, b, S2, λ, S0, a, S4, a, S5, λ, S0, b, S6, b, S2, λ, S0, b, S3, a, S9, a, S10, λ, S3, b, S8, b, S7, λ, S3, b, S8, b, S7, λ, S3, b, S8, b, S7, λ, S3)

Not in the language

**baab** – (S0, b, S3, a, S9, a, S10, λ, S3, b, error...)