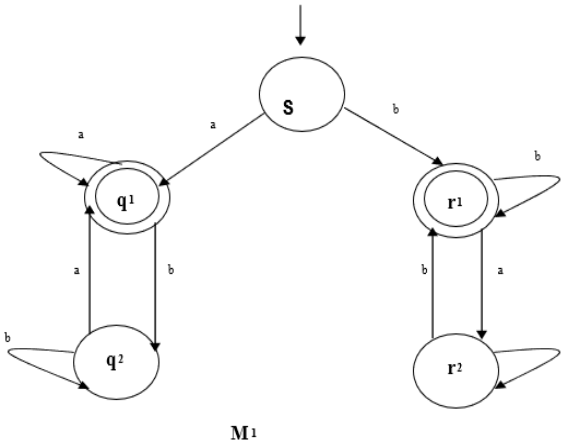
The figure below shows the state diagram of a finite automaton M_1. Give the formal description of this automaton. (5 Marks)

Provide a conclusion on the language accepted by this machine



M_1

	Input Alphabet	
States	a	b
S	q1	r1
q1	q1	q2
q2	q1	q2
r1	r2	r1
r2	r2	r1

Q = {S, q1, q2, r1, r2}

∑= {a, b}

δ = Transition Symbol

q_0= {S}

F = {q1, r1}

Possible path	Pattern
S--*b*-->r_1	*b*
S--*b*-->r_1--*b*-->r_1	*bb*
S--*b*-->r_1--*a*-->r_2--*b*-->r_1	*bab*
S--*b*-->r_1--*a*-->r_2--*a*-->r_2--*b*-->r_1	*baab*
S--*b*-->r_1 --*b*-->r_1 --*a*-->r_2--*b*-->r_1	*bbab*
S--*b*-->r_1 --*b*-->r_1 --*a*-->r_2--*a*-->r_2--*b*-->r_1	*bbaab*
S--*a*-->q_1	*a*
S--*a*-->q_1--*b*-->q_2--*a*-->q_1	*aba*
S--*a*-->q_1--*a*-->q_1	*aa*
S--*a*-->q_1--*a*-->q_1--*b*-->q_2 --*a*-->q_1	*aaba*
S--*a*-->q_1--*a*-->q_1--*b*-->q_2--*b*-->q_2 --*a*-->q_1	*aabba*

Conclusion

The machine accepts a language that either starts with an “a” and ends with an “a” or a language that starts with a “b” and ends with a “b”.

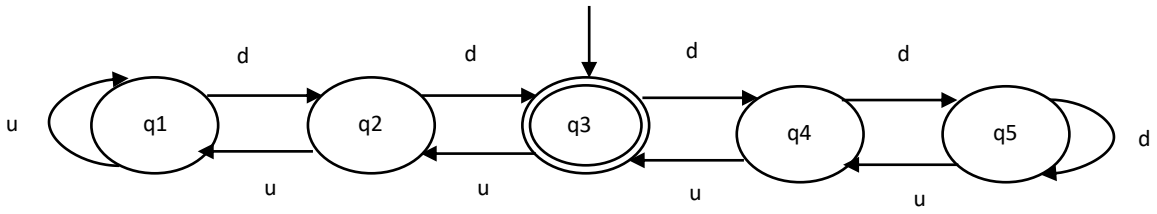
L(M1) = ∑ W ∈ W , **W** starts and ends with the same symbol.

Question Seven (from Logic & Truth Tables Lesson):

The formal description of a DFA is ({q_1, q_2, q_3, q_4, q_5}, (u, d),δ q_3, {q_3}), where δ is given by the following transition table. Give the state diagram of this machine. (8 Marks).

	u	d
q_1	q_1	q_2
q_2	q_1	q_3
q_3	q_2	q_4
q_4	q_3	q_5
q_5	q_4	q_5

State diagram of this machine



Possible path	Pattern
q_3--*u*--> q_0--*u*--> q_1--*u*--> q_1--*d*--> q_2--*d*--> q_3	*uuudd*
q_3--*u*--> q_0--*u*--> q_1--*d*--> q_2--*d*--> q_3	*uudd*
q_3--*d*--> q_4--*d*--> q_5--*d*--> q_5--*u*--> q_4--*u*--> q_3	*ddduu*
q_3--*d*--> q_4--*d*--> q_5--*u*--> q_4--*u*--> q_3	*dduu*

Conclusion

The machine accepts a language that starts with double ‘u’ and ends with double ‘d’ or starts with double ‘d’ and ends with double ‘u’.