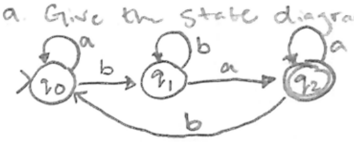
1. Let M be the deterministic finite automation defined by

$Q = \{q_0, q_1, q_2\}$
$\Sigma = \{a, b\}$
$F = \{q_2\}$

δ	a	b
q_0	q_0	q_1
q_1	q_2	q_1
q_2	q_2	q_0

Q finite set of states
Σ finite set ; alphabet
$q_0 \in Q$ the start state
F final or accepting states
δ transition function

a. Give the state diagram of M



b. Trace the computations of M that process the strings abaa, bbbabb, bababa, and bbbaa.

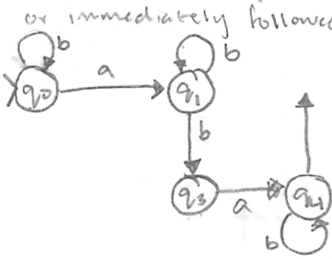
comp accept		comp reject		comp accept		comp accept	
$[q_0, abaa]$	q_0	$[q_0, bbbabb]$	q_0	$[q_0, bababa]$	q_0	$[q_0, bbbaa]$	q_0
$\vdash [q_0, baa]$	q_0	$[q_1, bbabb]$	q_1	$[q_1, ababa]$	q_1	$[q_1, bbaa]$	q_1
$\vdash [q_1, aa]$	q_1	$[q_1, babb]$	q_1	$[q_2, baba]$	q_2	$[q_1, baa]$	q_1
$\vdash [q_2, a]$	q_2	$[q_1, abb]$	q_1	$[q_0, aba]$	q_0	$[q_1, aa]$	q_1
$\vdash [q_2, \lambda]$	q_2	$[q_2, bb]$	q_2	$[q_0, ba]$	q_0	$[q_2, a]$	q_2
		$[q_0, b]$	q_0	$[q_1, a]$	q_1	$[q_2, \lambda]$	q_2
		$[q_1, \lambda]$	q_1	$[q_2, \lambda]$	q_2		

c. Which of the strings from part (b) are accepted by M
abaa, bababa, bbbaa

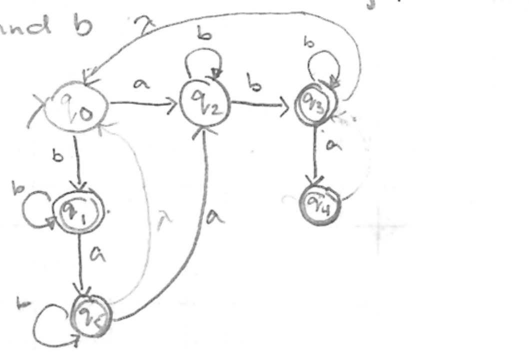
d. Give a regular expression for L(M)
All strings spelled by path q_0 to q_2

State	Paths to q_i	Simple Cycles from q_i to q_i	Accepted Strings
q_2	$a^*b^*a^*$	$a^*bb^*aa^*$	$a^*bb^*aa^*(ba^*bb^*aa^*)^*$

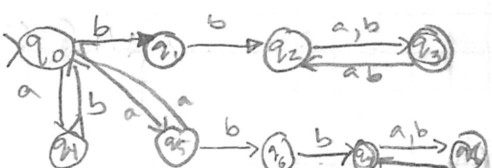
12. Build a DFA that accepts L
The set of strings over $\{a, b\}$ in which every a is either immediately preceded or immediately followed by b ie baab, aba, and b



✓ b^+ accept F(q_0)
✓ $(ab^+)^*$ accept F
✓ $(b^+a)^*$ accept
✓ $(ab^+a)^*$ accept
✓ $(b^+aab^+)^*$ accept
$(b^+ab^+)^*$ accept



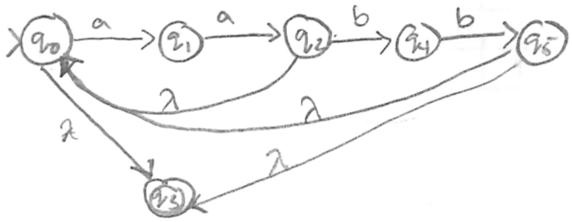
13. The set of strings of odd length that contain the substring bb.



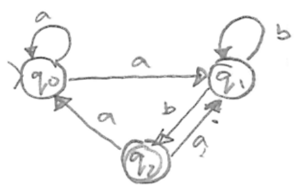
aaabb

22d Give the state diagram of a DFA that accepts the L

d) $((aa)^+bb)^*$



23. Let M be the nondeterministic finite automaton



a) construct the transition table of M

δ	a	b
q_0	$\{q_0, q_1\}$	$\emptyset$
q_1	$\emptyset$	$\{q_1, q_2\}$
q_2	$\{q_1, q_0\}$	$\emptyset$

b. Trace all the computations of the String aaabb in M

$[q_0, aaabb]$	q_0	$[q_0, aaabb]$	q_0	$[q_0, aaabb]$	q_0
$[q_0, aabb]$	q_0	$[q_0, aabb]$	q_0	$[q_0, aabb]$	q_0
$[q_0, abb]$	q_0	$[q_0, abb]$	q_0	$[q_0, abb]$	q_0
$[q_1, bb]$	q_1	$[q_1, bb]$	q_1	$[q_0, bb]$	q_0
$[q_1, b]$	q_1	$[q_1, b]$	q_1		
$[q_2, \lambda]$	q_2	$[q_1, \lambda]$	q_1		

c. Yes aaabb is in L(M)

d. Give a regular expression for L(M)

$(a^+b^+) \cup (a^*ab^*b)$

25d. $(ba \cup bb)^* \cup (ab \cup aa)^*$