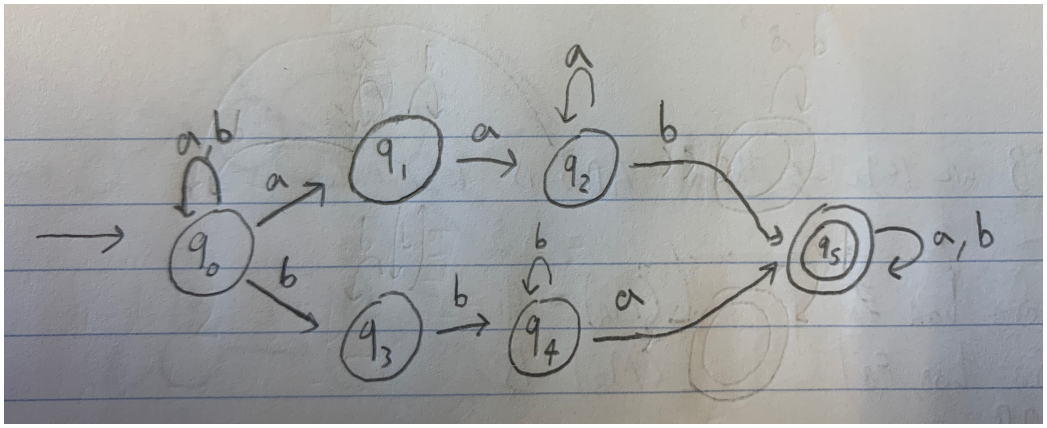
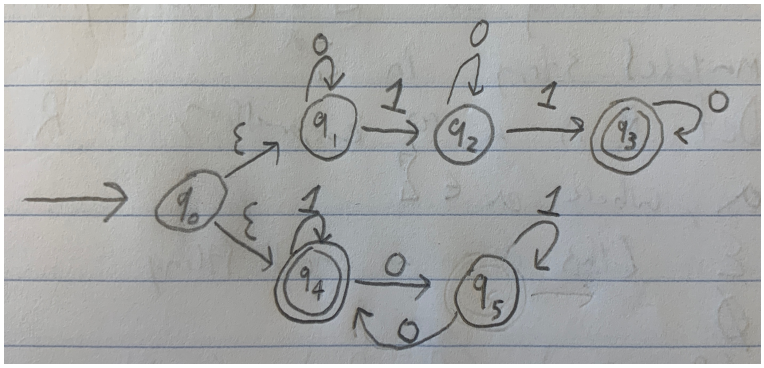
2. A.



The idea behind this machine is that we only care if the machine contains aab or bba. The upper portion handles the case for aab and the lower portion handles the bba. Since we only care if it is contained, on the top portion we check for aa*b as there could be any number of a's leading up to the b as long as there are two or more.

The same idea applies to the lower portion where its bb*a as there could be any number of b's as long as there are two or more. If the machine finds aab or bba it moves us to q_5 which is an accept state and it will stay there as q_5 goes to q_5 no matter the input.

B.



Our language accepts if there are exactly two ones or an even number of zeros. The upper portion checks for exactly two ones, it does this by allowing any number of 0s and move forward through the three states if there is a one. If we reach the third state, q_3, we know that there have been two exactly two 1's. If there is another 1 the state will die as there is no where to go, otherwise it will be accepted after finishing as zeros will loop back.

The bottom portion is checking for an even amount of zeros. It does this by moving between q_4 and q_5 whenever a 0 is encountered, move to q_5 if the number is odd and to q_4 if even. I made q_4 an accept state after the ϵ since no 0's is an even amount.