**Automata practice Question and solutiona by saba sumreen**

**Q:No.1)All words in which a appears tripled, if at all. This means that every clump of a's contains 3 or 6 or 9 or 12... a's.**

**(aaa+b)***

**Q:No.2)All words that contain exactly three b's in total.**

**(a*ba*ba*ba*)**

**Q:No.3) All words that contain exactly two b's or exactly three b's, not more**

**(a*ba*ba*)+(a*ba*ba*ba*)**

**Q:No.4) All strings that end in a double letter.**

**(a+b)*(aa+bb)**

**Q:No.5) All strings that have exactly one double letter in them.**

**(b+^)(ab)*aa(ba)*(b+^)+(a+^)(ba)*bb(ab)*(a+^)**

**Q:No.6)All strings in which the letter b is never tripled. This means that no word contains the substring bbb.**

**(^+b+bb)(a+ab+abb)***

**Q:No.7). All words in which a is tripled or b is tripled, but not both. This means each word contains the substring aaa or the substring bbb but not both.**

**Λ + b + bb)(a + ab + abb)*aaa(Λ + b + bb)(a + ab + abb)* +**

**(Λ + a + aa)(b + ba + baa)*bbb(Λ + a + aa)(b + ba**

**Q:No.8) (i) All strings that do not have the substring ab**

**b*a***

**. (ii) All strings that do not have both the substrings bba and abb.**

a*(baa*)*b* + b*(a*ab)*a*

- LHS: If there's a double b, it's not followed by an a.
- RHS: If there's a double b, it's not preceded by an a.

**Q:No.10)All strings in which any b's that occur are found in clumps of an odd number at a time, such as abaabbbab.**

a*(b(bb)*aa*)*(/\ + b(bb)*)

**(ii) All strings that have an even number of a's and an odd number of b's.**

(aa + bb + (ab + ba)(aa + bb)*(ab + ba))*

**(iii) All strings that have an odd number of a's and an odd number of b's.**

(aa + bb + (ab + ba)(aa + bb)*(ab + ba))*

(ab + ba)(aa + bb + (ab + ba)(aa + bb)*(ab + ba))*

The smallest string is ab or ba

- . Even letters can be added to the left, right, or both.