Assignment-01

Q1.> language (WEIRD) = {odd numbers of b's and an even numbers of a's}

$\Sigma = \{a, b\}$

language (WEIRD) = $\{a^{2n} b^{2n+1} \mid n = 0, 1, 2, 3, \ldots\}$
= { b, aab, aba, baa, bbb, ... }

by Recursive definition for WEIRD :-

Rule 1 : b ∈ WEIRD
Rule 2 : If w ∈ WEIRD, then aaw, ~~awaa~~ b awa,
        waa, wbb are in WEIRD
Rule 3 : The only elements in WEIRD are the ones
        that are constructed by following rules 1 &
        2.

Q2> 4-PERMUTATION = {1234, 4231, ~~342~~ 3241 , 1243,
                    3214, 4213}

Q3> (a) L = {aab, ba, bb, baab}

Regular expression;
    → (aab + ba + bb + baab)

(b) The language of all strings containing exactly
    two b's:
        { bb, abb, ~~bab~~ bba, aabb, ... }
Regular expression:
        ~~(a+b)* b (a+b~~
    → a*b a*b a*

(c) The language of all strings containing at least one a and at least one b.

$$\{ ab, aab, aba, baa, abb, bab, bba, aaab \dots \}$$

Regular expression:

$$\Rightarrow \quad (a+b)^* \; a \; (a+b)^* \; b \; (a+b)^*$$

(d) The language of all strings that do not end with ba.

$$\{ \wedge, a, b, ab, aa, ba, bb, \dots \}$$

Regular Expression:

$$\Rightarrow \quad (a+b)^* \; (aa + ab + bb) + a + b + \wedge$$

(e) The language of all strings that do not containing the substring bb.

$$\{ \wedge, a, b, aa, ab, ba, aaa, aba, baa, abb, \dots \}$$

Regular Expression:

$$\Rightarrow \quad \wedge + (a^* b)^* + a^*$$

(f) The language of all strings in which every b is followed immediately by aa

$$\{ \wedge, a, baa, abaa, aabaa, aabaaaa, baabaa, ba \dots \}.$$

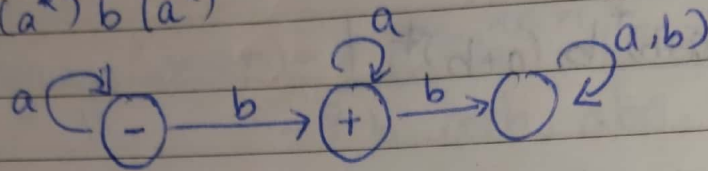Regular Expression:

$$\wedge + a^* + a^* (baa)^* \; a^*$$

Q4 · $S = \{a, b\}$

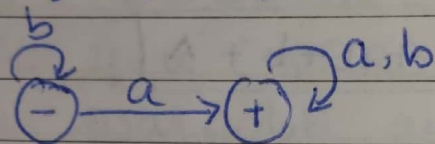**(a)** L = {all strings with exactly one b}

    {b, ab, ba, abba, ... }

    $(a^*)\, b\, (a^*)$

(b) L = {all strings with at least one a}

    {a, ab, aa, ba, abb, ... }

(c) L = {all strings with no more than 3 b's}

    {a, b, aa, bb, aaa, bbb, ... }
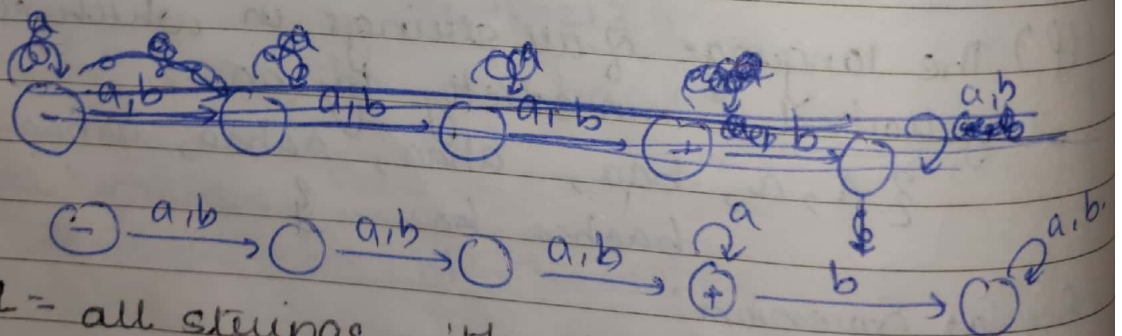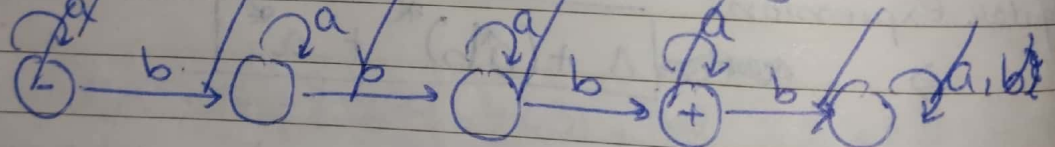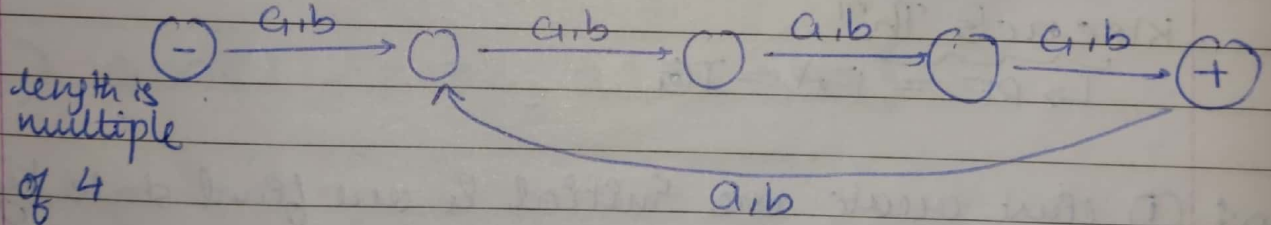

(d) L = all strings with at least one a and exactly 2 b's.
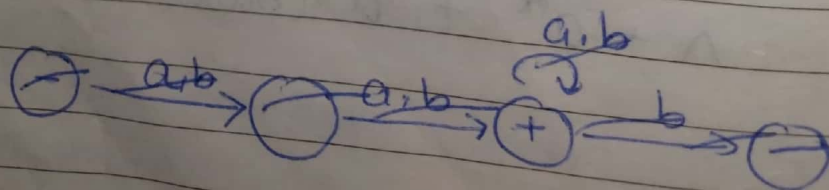
(d)
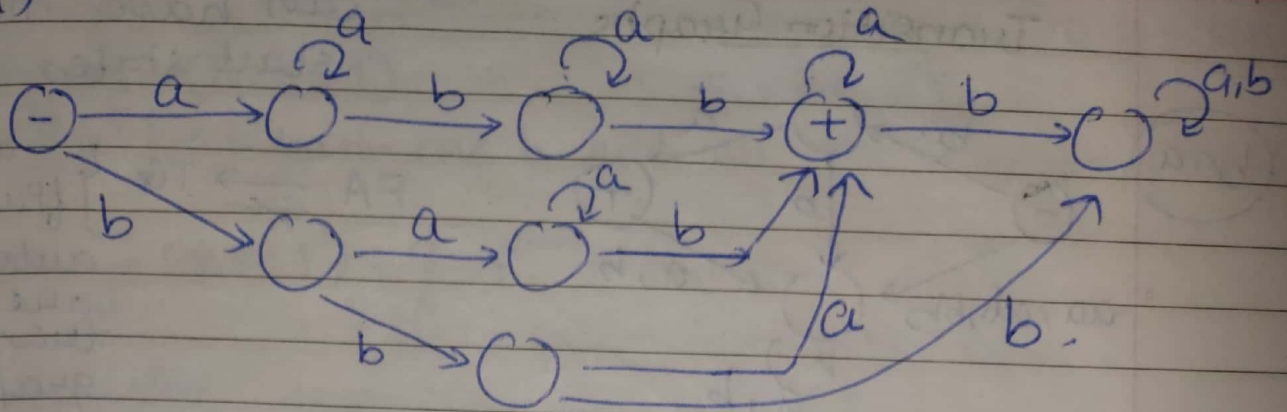
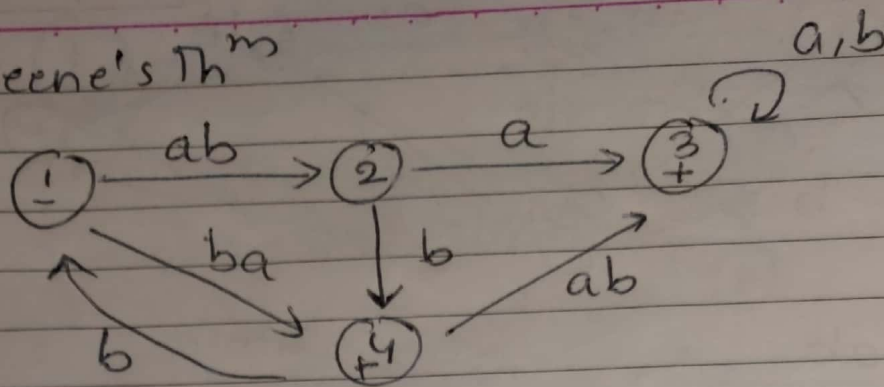(e) L = {all strings with b as third letter}
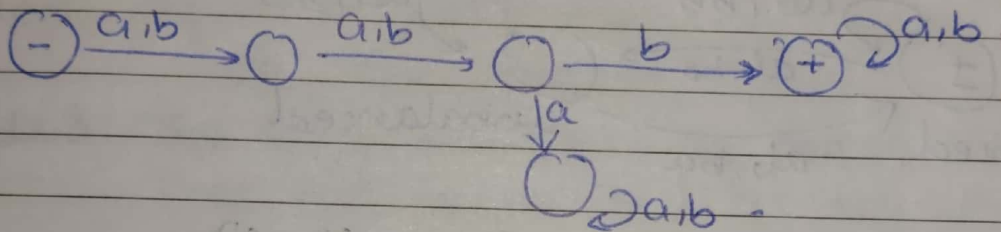
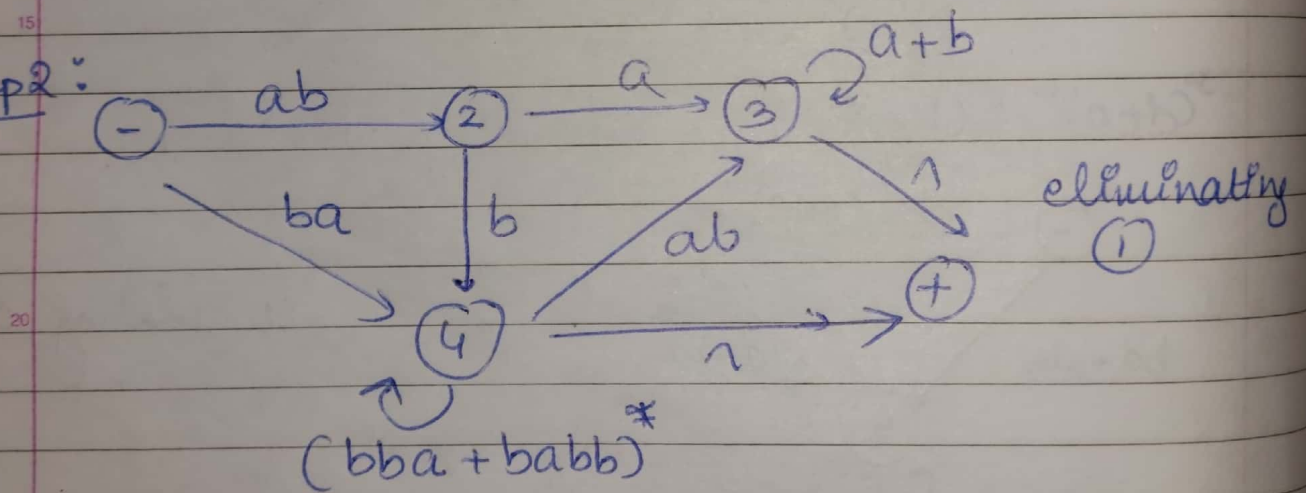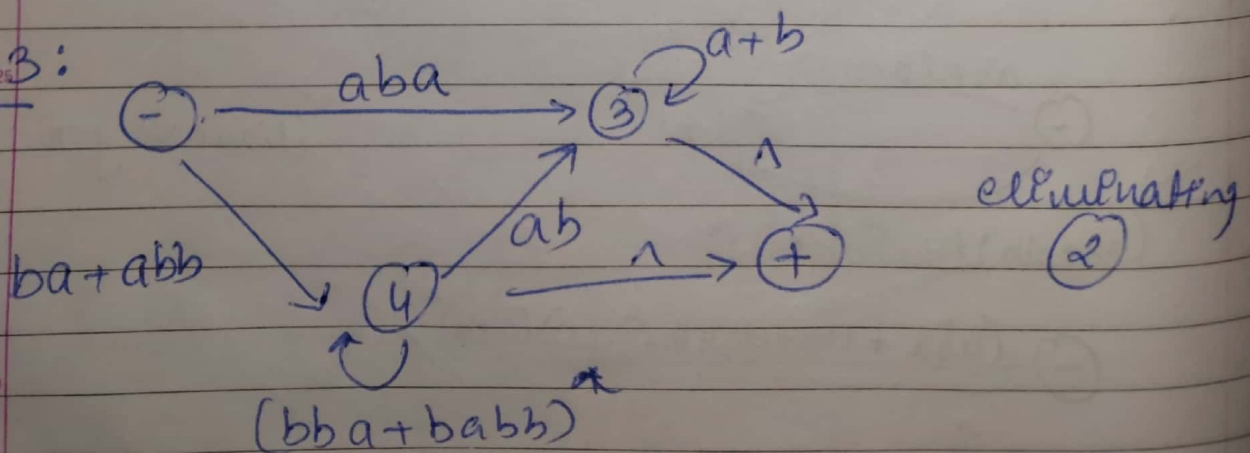(f) L = { w, |w| mod 4 = 0 }

length is
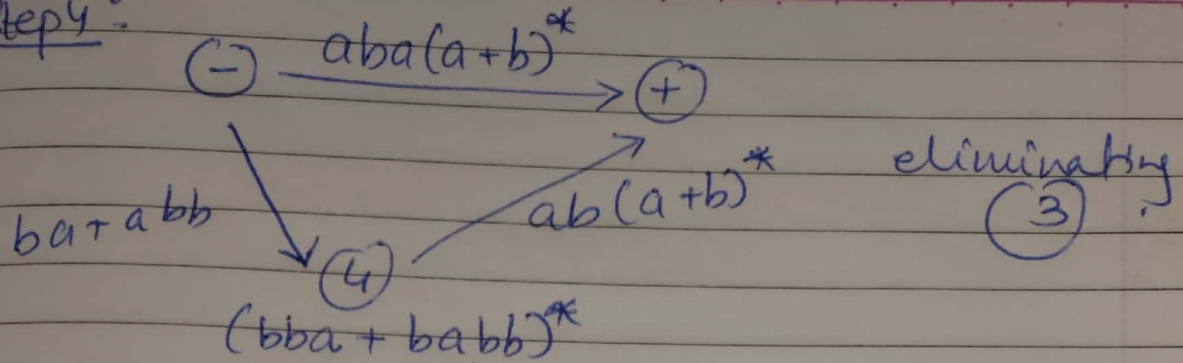multiple
of 4

Assn 1

Q5. Kleene's Th^m

Step 1:

Step 2:

eliminating
①

$(bba + babb)^*$

Step 3:

eliminating
②

$(bba + babb)^*$

Step 4:

$$\ominus \xrightarrow{\quad aba(a+b)^* \quad} \oplus$$

$ba + abb$

$ab(a+b)^*$

$\textcircled{4}$

$(bba + babb)^*$

eliminating $\textcircled{3}$;

Step 5:

$$\ominus \xrightarrow{\quad aba(a+b)^* \quad} \oplus \quad \text{eliminating } \textcircled{4}.$$

$$(ba + abb)(bba + babb)^* ab(a+b)^*$$
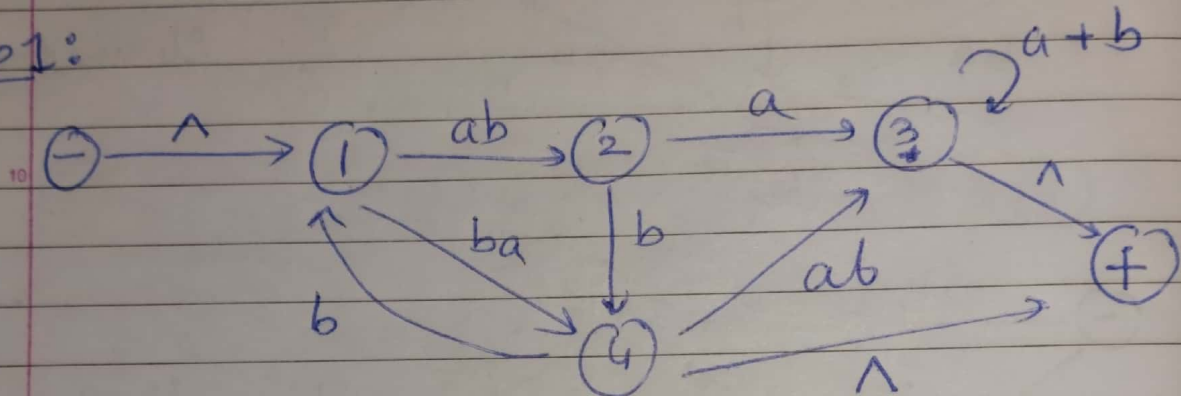
Step 6:
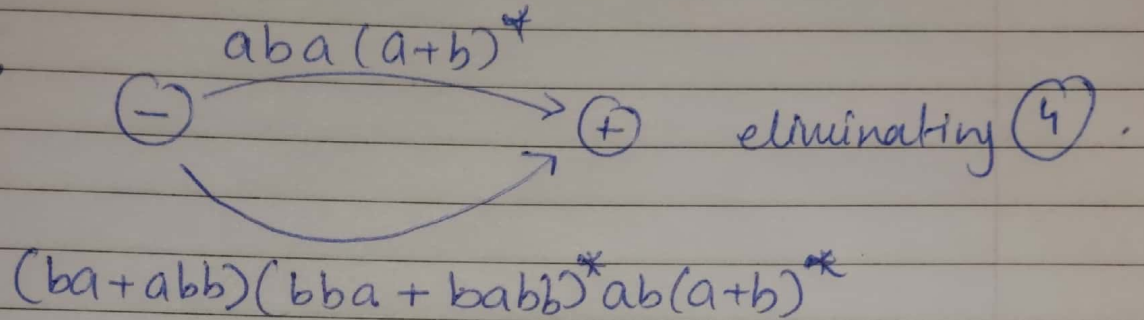
$$\ominus \xrightarrow{\quad aba(a+b)^* + (ba+abb)(bba+babb)^* ab(a+b)^* \quad} \oplus$$

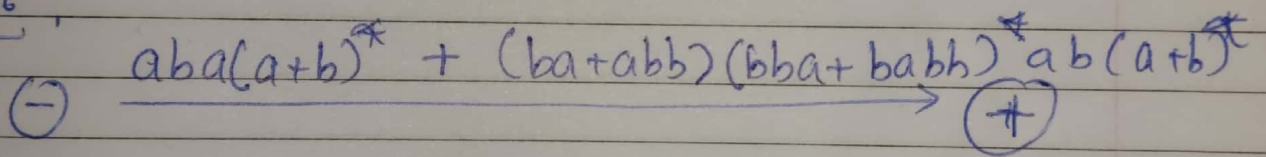**Regular Expression:**

$$\boxed{aba(a+b)^* + (ba+abb)(bba+babb)^* ab(a+b)^*}$$