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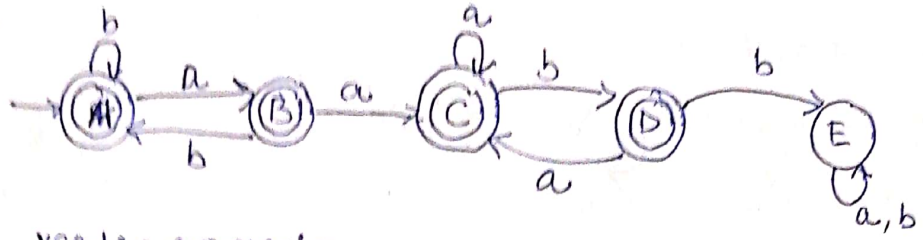
Section: BCS-5B
Course: Theory of Automata

Question 1

ii.

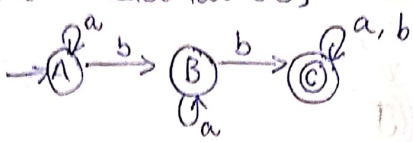


regular expression

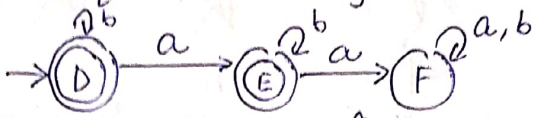
$$(b+ab)^*(a+ba)^*(b+\Lambda)$$

$L = \{\Lambda, a, b, aaa, aab, aba, baa, abb, bab, bba, bbb,$
$aaaa, aaab, aaba, abaa, abab, abba, abbb, baaa, baab,$
$baba, babb, bbaa, bbab, bbba, bbbb\}$

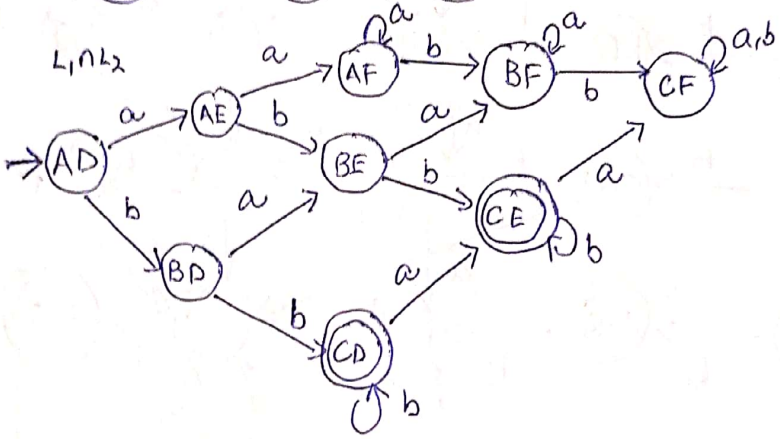
iii. L_1: {at least two b's}



L_2 = {at most one a}



$L_1 \cap L_2$

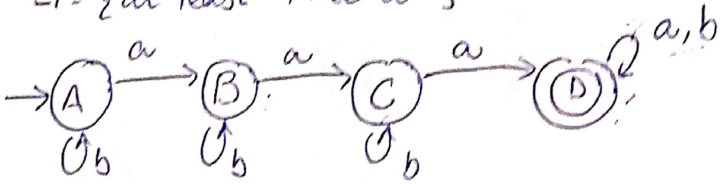


regular expression

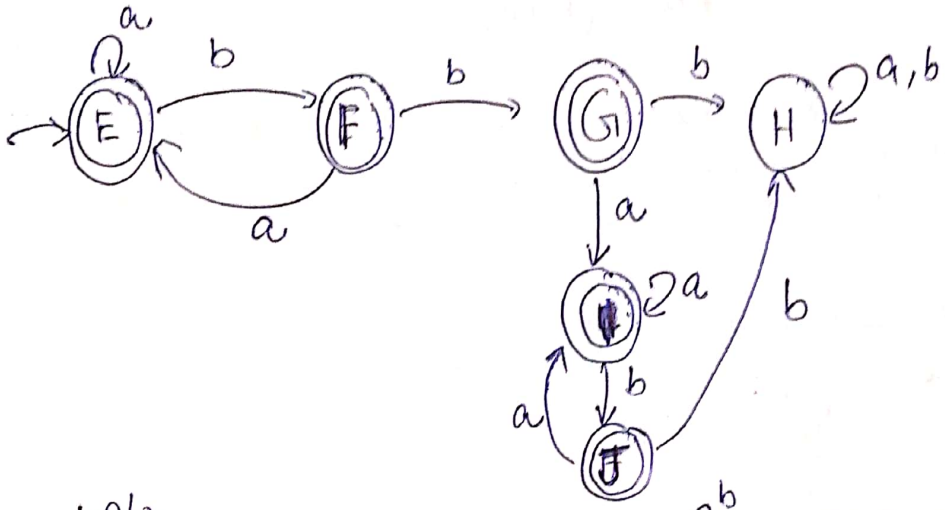
$$b^*(bb + abb + bab + bba + bbb)b^*$$

$L = \{bb, abb, bab, bba, bbb, abbb, babb, bbab, bbba, bbbb, \ldots\}$

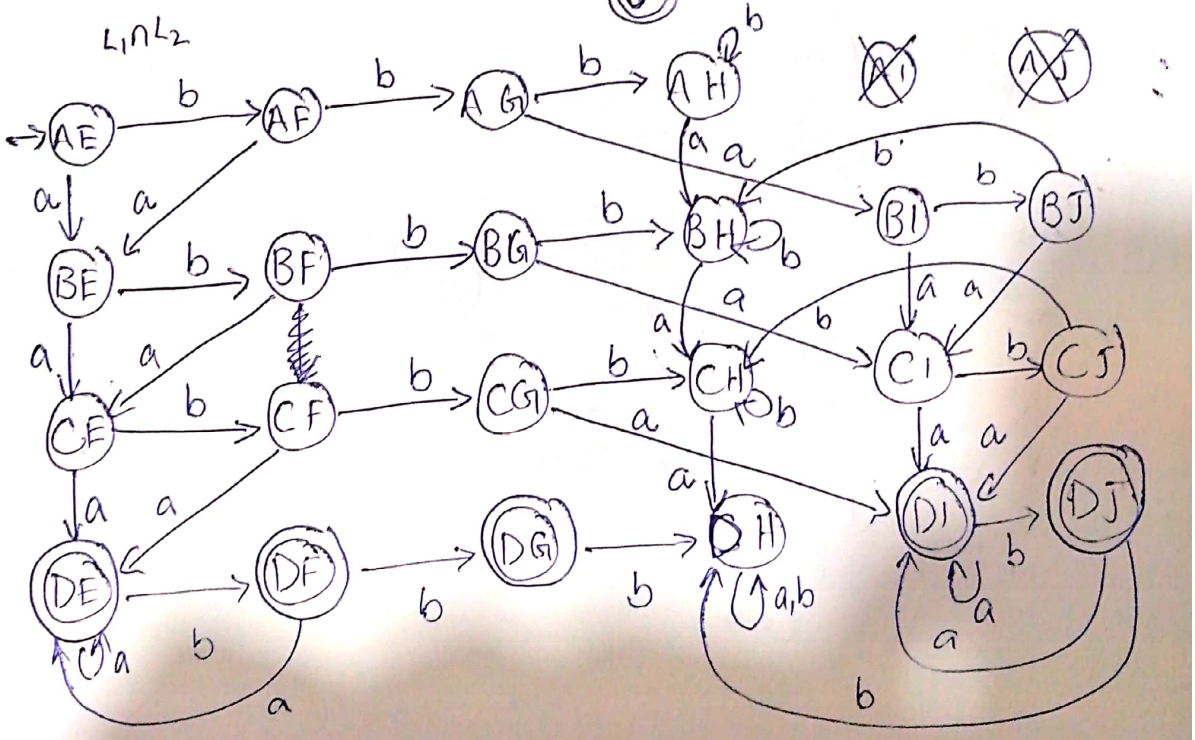
vii. $L_1 = \{$at least three a's$\}$



$L_2 = \{$n more than one occurrence of substring bb$\}$



$L_1 \cap L_2$



Question 3

regular expression

~~$a^+a^+a^+(\Lambda+b+bb)+a^+a^+(\Lambda+b+bb)a^+ + a^+(\Lambda+b+bb)a^+a^+$~~

L = { aaa, aaaa, aaab, aaba, abaa, baaa, bbaaa, aaaaa, aaaab, aaaba, aabaa, abaaa, baaaa, abbaa, aabba, aaabb, ... }

Q2:-

(i) $\delta^*(AE, abbaaa)$

$= \delta(\delta^*(AE, abbaa), a)$

$= \delta(\delta(\delta^*(AE, abba), a), a)$

$= \delta(\delta(\delta(\delta^*(AE, abb), a), a), a)$

$= \delta(\delta(\delta(\delta(\delta^*(AE, ab), b), a), a), a)$

$= \delta(\delta(\delta(\delta(\delta(\delta^*(AE, a), b), b), a), a), a)$

$= \delta(\delta(\delta(\delta(\delta(\delta(\delta^*(AE, \Lambda), a), b), b), a), a), a)$

$= \delta(\delta(\delta(\delta(\delta(\delta(AE, a), b), b), a), a), a)$

$= \delta(\delta(\delta(\delta(BE, b), b), a), a), a)$

$= \delta(\delta(\delta(BF, b), a), a), a)$

$= \delta(\delta(BG, a), a), a)$

$= \delta(\delta(CI, a), a)$

$= \delta(DI, a)$

$= DI$ accepted.

ii. $\delta^*(AE, abbbabbb)$

$= \delta(\delta^*(AE, abbbabb), b)$

$= \delta(\delta(\delta^*(AE, abbba), b), b)$

$= \delta(\delta(\delta(\delta^*(AE, abbb), a), b), b), b)$

$= \delta(\delta(\delta(\delta(\delta^*(AE, abb), b), a), b), b), b)$

$= \delta(\delta(\delta(\delta(\delta(\delta^*(AE, ab), b), b), a), b), b), b)$

$= \delta(\delta(\delta(\delta(\delta(\delta(\delta^*(AE, a), b), b), b), a), b), b), b)$

$= \delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta^*(AE, \Lambda), a), b), b), b), a), b), b), b)$

$= \delta(\delta(\delta(\delta(\delta(\delta(\delta(\delta(AE, a), b), b), b), a), b), b), a)$

$= \delta(\delta(\delta(\delta(\delta(\delta(\delta(BE, b), b), b), a), b), b), b)$

$= \delta(\delta(\delta(\delta(\delta(\delta(BF, b), b), a), b), b), b)$

$= \delta(\delta(\delta(\delta(\delta(BG, b), a), b), b), b)$

$= \delta(\delta(\delta(\delta(BH, a), b), b), b)$

$= \delta(\delta(\delta(CH, b), b), b)$

$= \delta(\delta(CH, b), b)$

$= \delta(CH, b)$

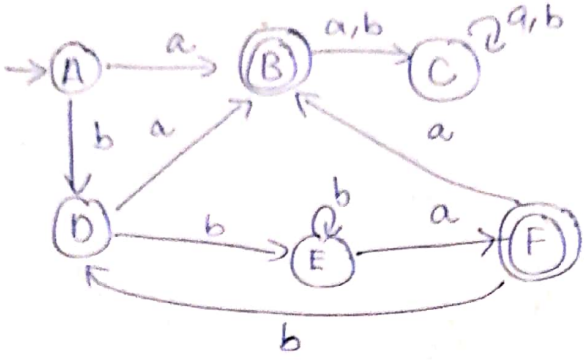
$= CH$ rejected

Question 3

(i)

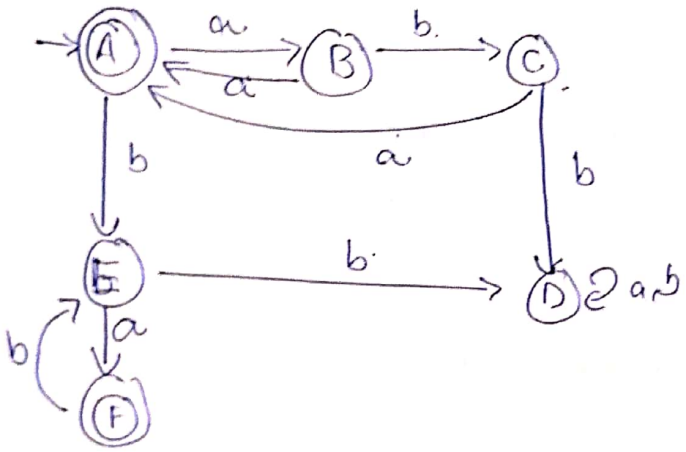
(g) $\{b, bba\}^*\{a\}$

$(b + bba)^*(a)$

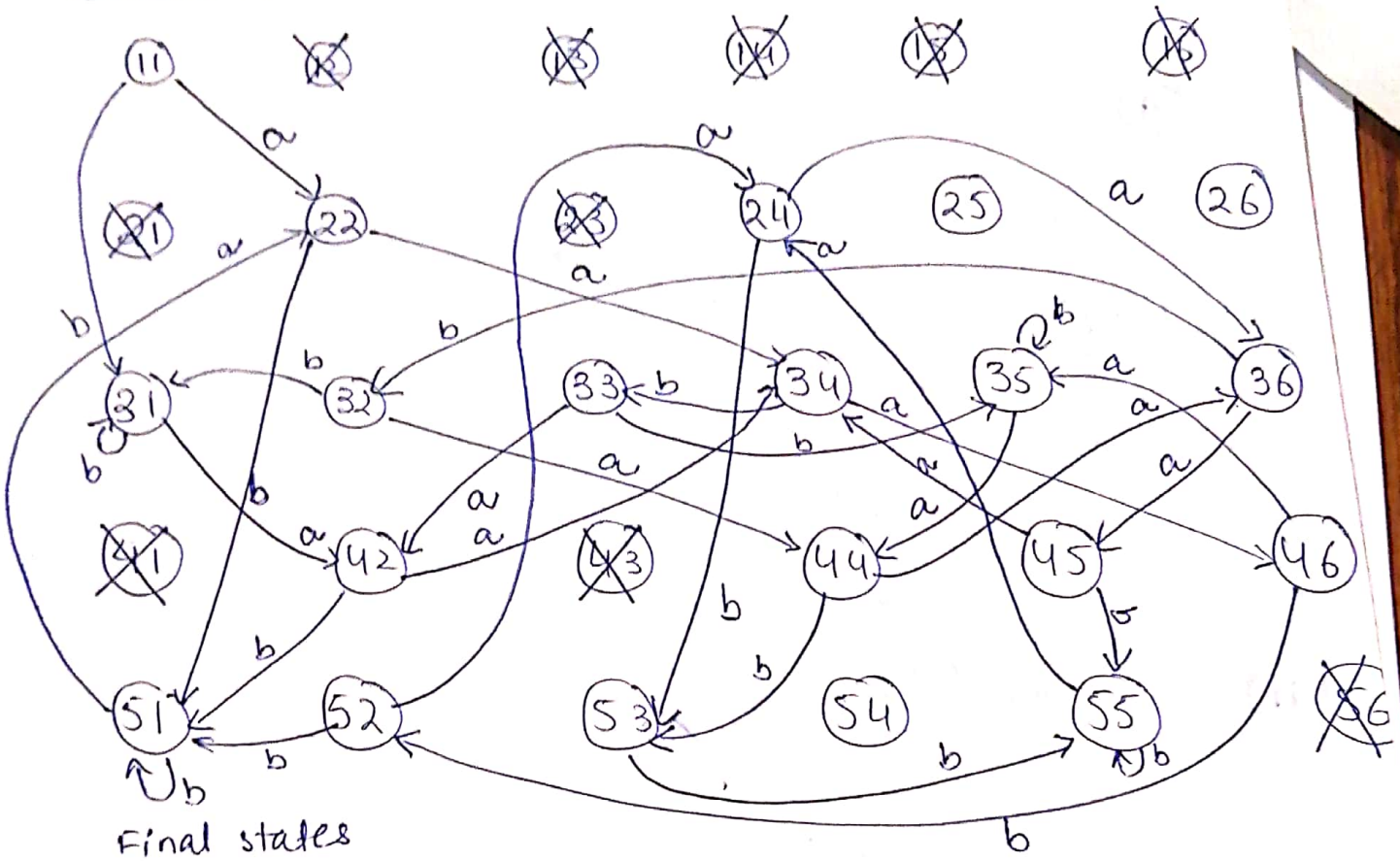


(h) $\{aba, aa\}^*\{ba\}^*$

$(aba + aa)^*(ba)^*$



Question 4



(ii) $L_1 \cap L_2$ = 52, 55

(iii) $L_1 \cup L_2$ = 51, 52, 53, 55, 42, 32, 22, 45, 35

(iii) $L_1 - L_2$ = 51, 53

(iv) $L_2 - L_1$ = 22, 32, 42, 35, 45