Date
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Name : Sradha Kedia
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Exam Roll num : 20234757053
Name of the programme : MCA
Semester : III
Unique paper code : 22340303
Title of the paper : Automata Theory
Name of the dept : DUCS
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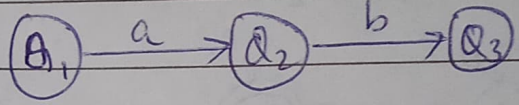
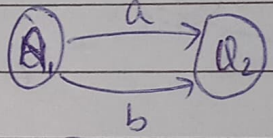
Question no. : 5
Page no. : 5

Ans 5 a) $RE = ba + (a + bb)a^*b$

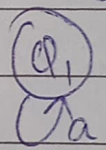
(i) ab

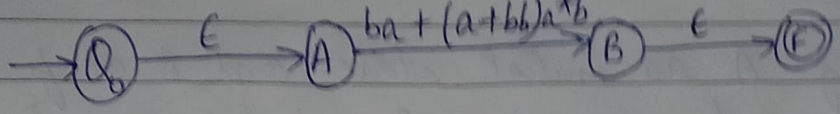


(ii) $a + b$

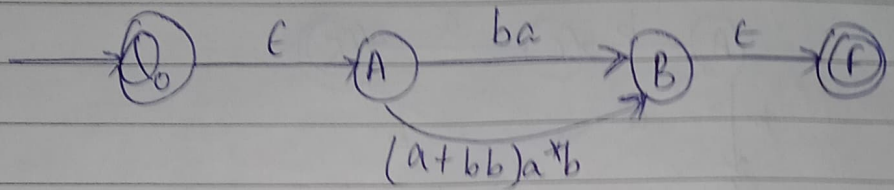


(iii) a^*

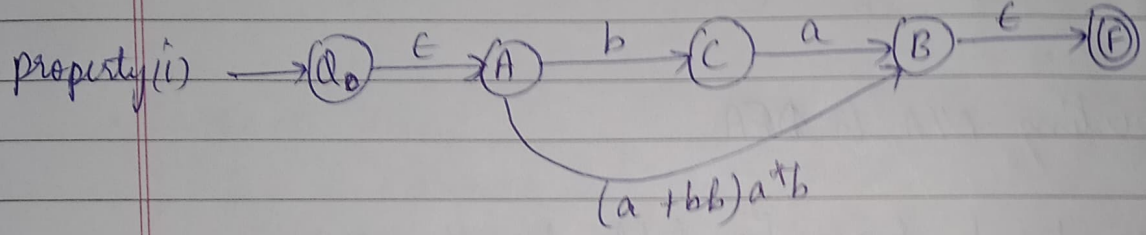




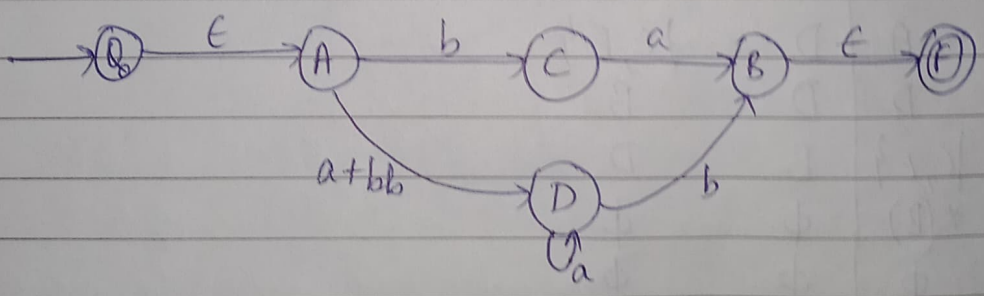
where Q_0 is initial state and f is final state using the property (ii)



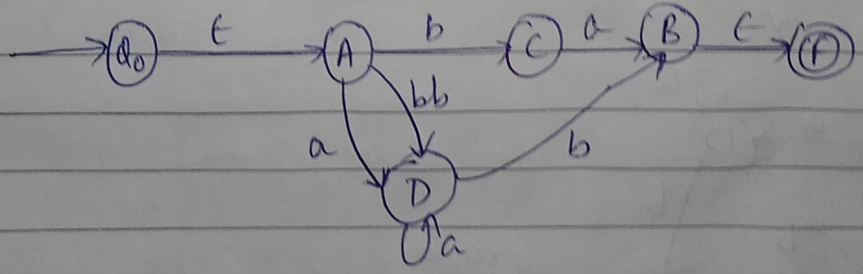
property (i)

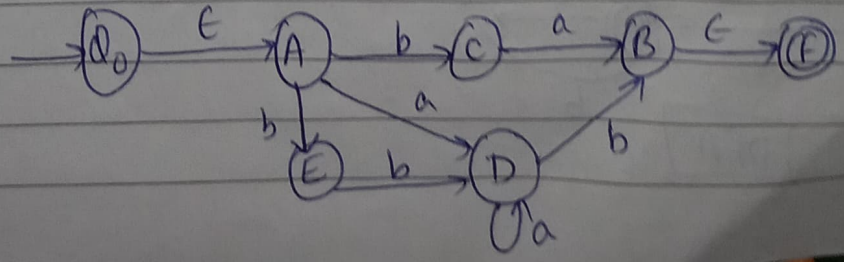


(a+bb)a*b → again property (i), and (iii)



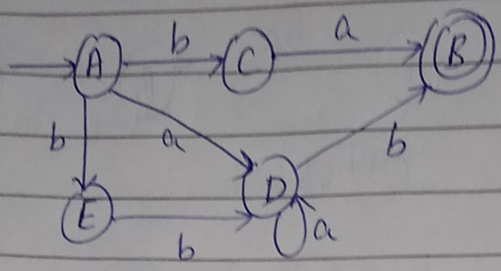
a+bb → A to D by property (ii)





making A as initial state and B as final state and removing q_0 and f, we get

our NFA for RE, is



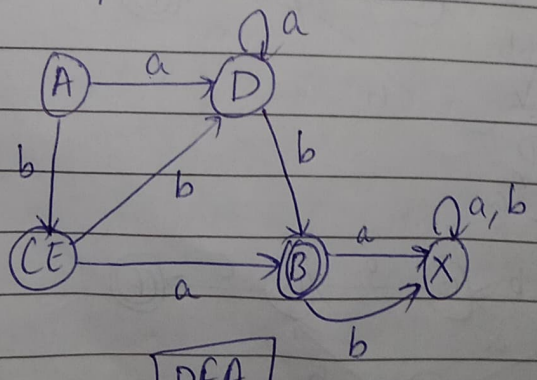
converting NFA to DFA

we construct transition table for the NFA

	a	b
→A	D	{C,E}
D	D	B
{C,E}	B	D
*B	ϕ	ϕ
ϕ	ϕ	ϕ

let {C,E} = CE

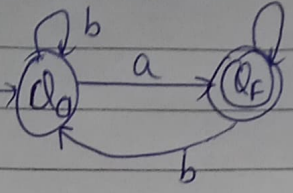
ϕ = X



DFA

(b) • $L_1 : (a+b)^* a$

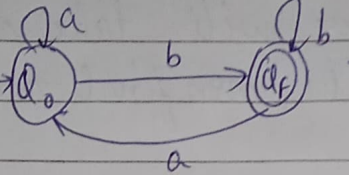
FA_1 :



(i)

$L_2 : (a+b)^* b$

FA_2 :



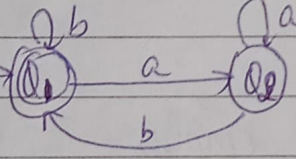
(ii)

• → $FA_1' \cap FA_2$ DFA for $L_1 \cap L_2 = FA_1 \cap FA_2$

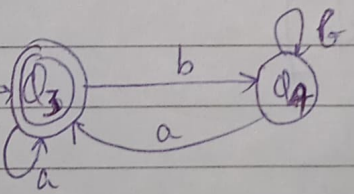
by De Morgan's law

$(FA_1' \cup FA_2')'$

FA_1' =



FA_2' =



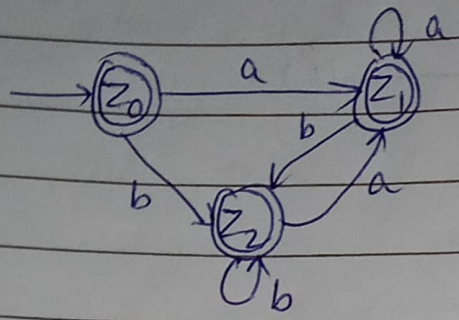
now finding union, $(FA_1' \cup FA_2')$

Transition table : $FA_1' \cup FA_2'$

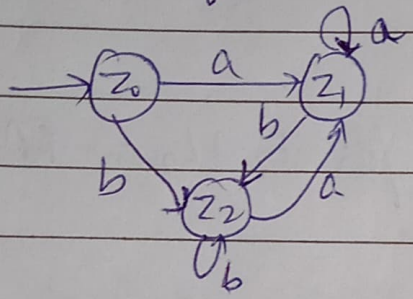
Q \ Σ	a	b
* $[Q_1, Q_3]$	$[Q_2, Q_3]$	$[Q_1, Q_4]$
* $[Q_2, Q_3]$	$[Q_2, Q_3]$	$[Q_1, Q_4]$
* $[Q_1, Q_4]$	$[Q_2, Q_3]$	$[Q_1, Q_4]$

$[Q_1, Q_3] = Z_0$
$[Q_2, Q_3] = Z_1$
$[Q_1, Q_4] = Z_2$

DFA:



now, in $(FA_1' \cup FA_2')'$, we will take above DFA and make all final state, non final and vice versa.



$\Rightarrow FA_1 \cap FA_2$

∴ we see above DFA implies

$$\boxed{FA_1 \cap FA_2 = \phi}$$