(A.) DFA with Thomsons Construction Method

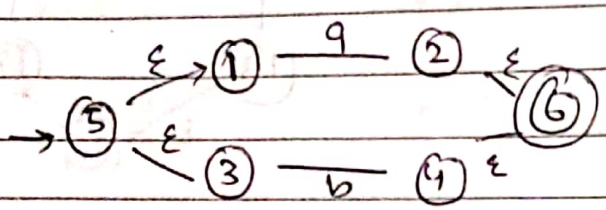
① $(a|b)^* a (a|b)$

Sol^n

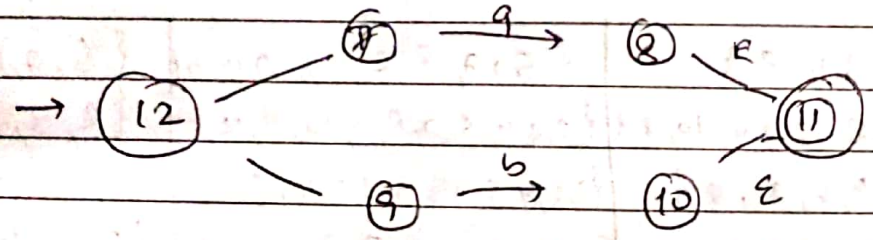
$= R_1 R_2 R_3 = (R_4)^* R_2 (R_5|R_6)$

$= (R_4|R_5)^* R_2 (R_4|R_5)$

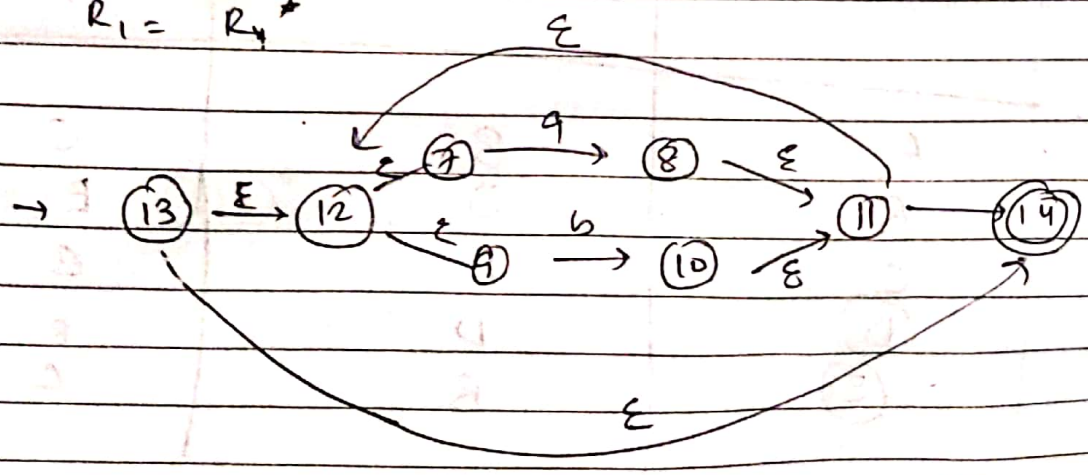
new $R_3 = R_5|R_6$



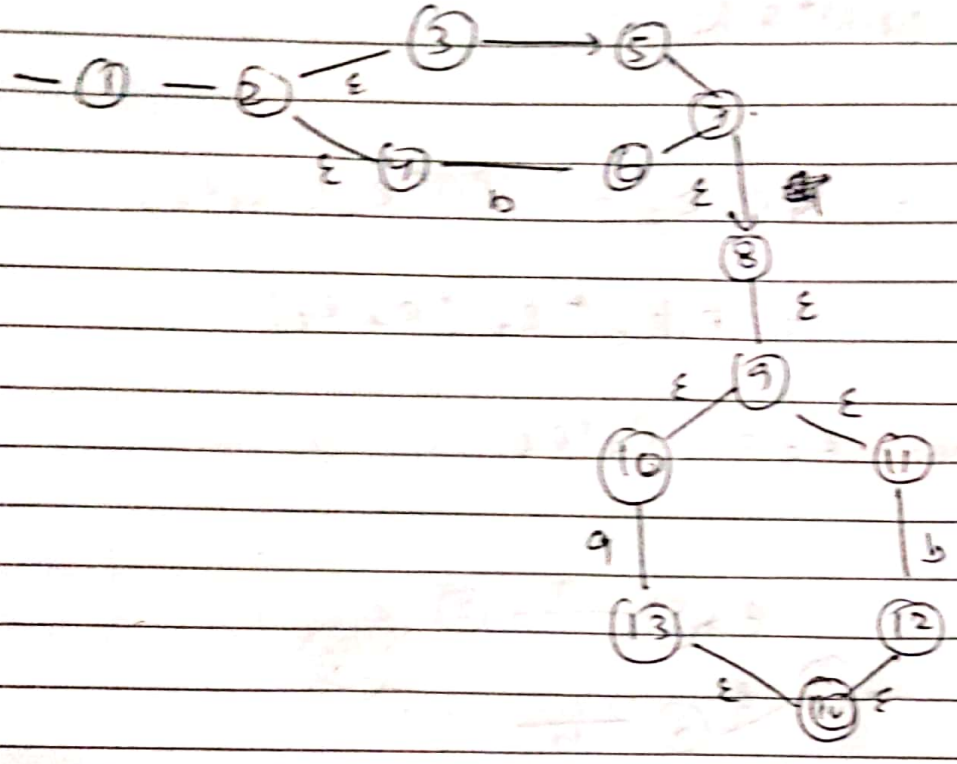
$R_4 = R_7|R_8$



$R_1 = R_4^*$



R_2 : → (15) —a→ (16)

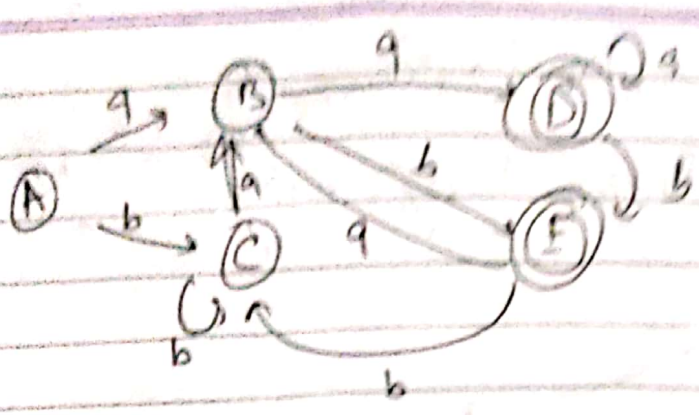


ε - NFA

Set Construction to create DFA

	a	b
{1,2,3,4,8}	{5,7,8,2,3,4,9,14,11}	{6,7,8,2,3,4}
{5,7,8,2,3,4,10,13}	{2,3,4,5,7,8,9,10,11,12,14}	{2,3,4,6,7,8,13,14}
{2,3,4,6,7,8}	{2,3,4,5,7,8,9,10,11,}	{2,3,4,6,7,8}
{2,3,4,5,7,9,10,11,12}	{2,3,4,5,7,8,9,10,11}	{2,3,4,6,7,8,13,14}
{2,3,4,6,7,8,13,14}	{2,3,4,5,7,8,9,10,11}	{2,3,4,6,7,8}

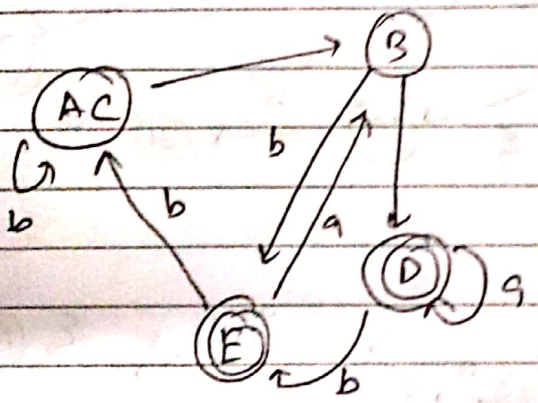
→		a	b
	A	B	C
	B	D	E
	C	B	C
	(D)	D	E
	(E)	B	C



* Subset for minimization:

0th :	{A, B, C}	{D, E}
1st :	{A, C}	{D}
	{B}	{E}
2nd :	{A, C}	{B} {D} {E}

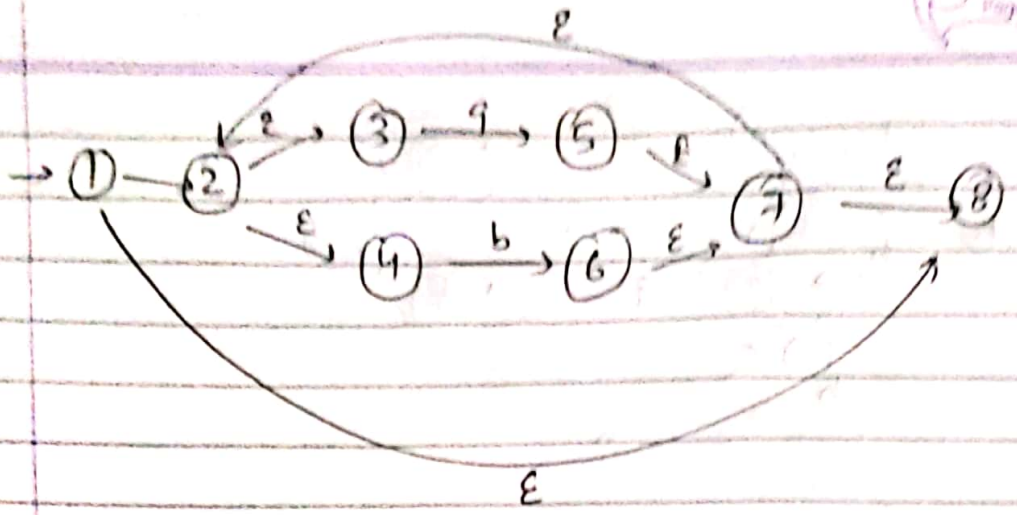
→ Minimized DFA



[(a|b)* a (a|b)]

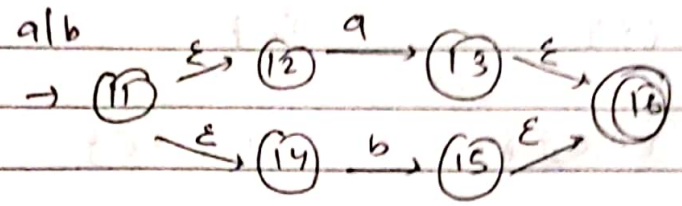
(Q2) (a|b)* a (a|b) (a|b)

$R_1 = (a|b)^*$

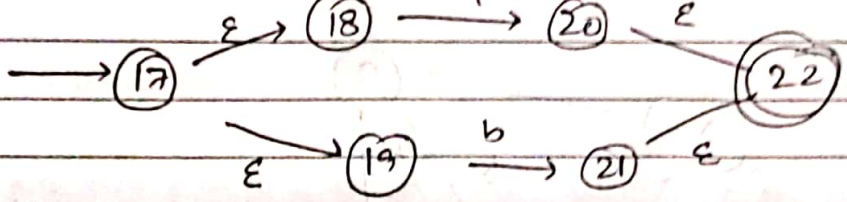


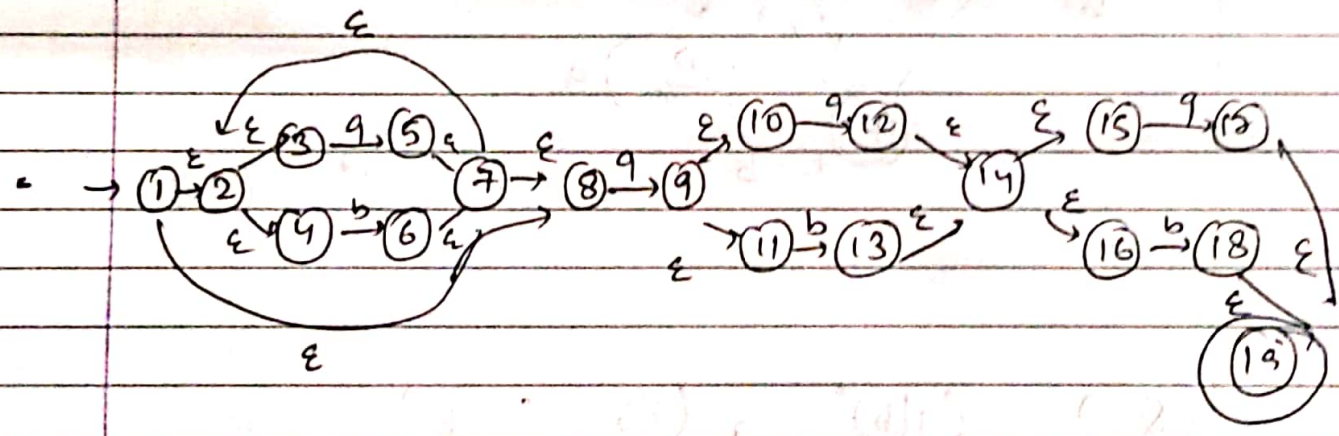
$R_2 = a$

$R_3 = a|b$



$R_4 =$





ε - NFA

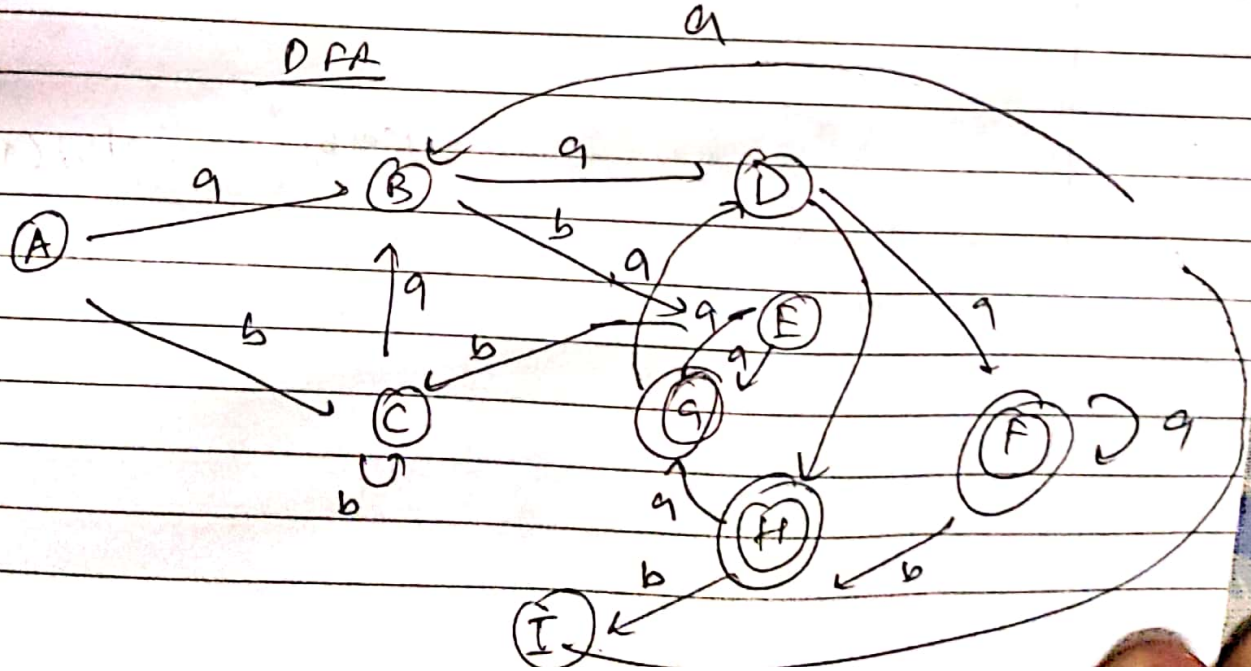
→ SET Construction

	a	b
{1,2,3,4,8}	{2,3,4,5,7,8,9,10,11}	{2,3,4,6,7,8}
{2,3,4,5,7,9,10,11}	{2,3,4,5,7,8,9,11,12,13,14}	{8,3,4,6,7,8}
{2,3,4,6,8,7}	{2,3,4,5,7,8,9,10,11}	{2,3,4,7,8,7,8,3}
{2,3,4,5,6,7,8,9,10,11,12,13,14,15,16}	{2,3,4,5--10,11,12,17,13}	{2,3,7,6,8,13,14,15,16}
{2,3,4,6,7,8,13,14,15,16}	{2,3,4,3,7,8,--17,19}	{2,3,4,6,7,13}
{2,4,5,7,8,9,10,11,--}	{2,3,4,5,7,8,9--14,15,16,17}	{2,--8,13-16,18}
{2,3,4,5,7,8,9,10,11,12}	{2,3,4,5,7,9,8,11,12,15}	{2-4,6,78,13--16}
{2,3,4,6,7,8,9,10,11,12}	{2,3,4,5--19}	{2,-4,6,--8,18,19}
{2,3,4,6,78,18,19}	{2,3,4,5,7,8,55,10}	{2,-4,6,-8}

→

A	B	C
B	D	E
C	B	C
D	F	H
E	G	C
F	f	H
G	D	E
H	G	I
I	B	C

DFA



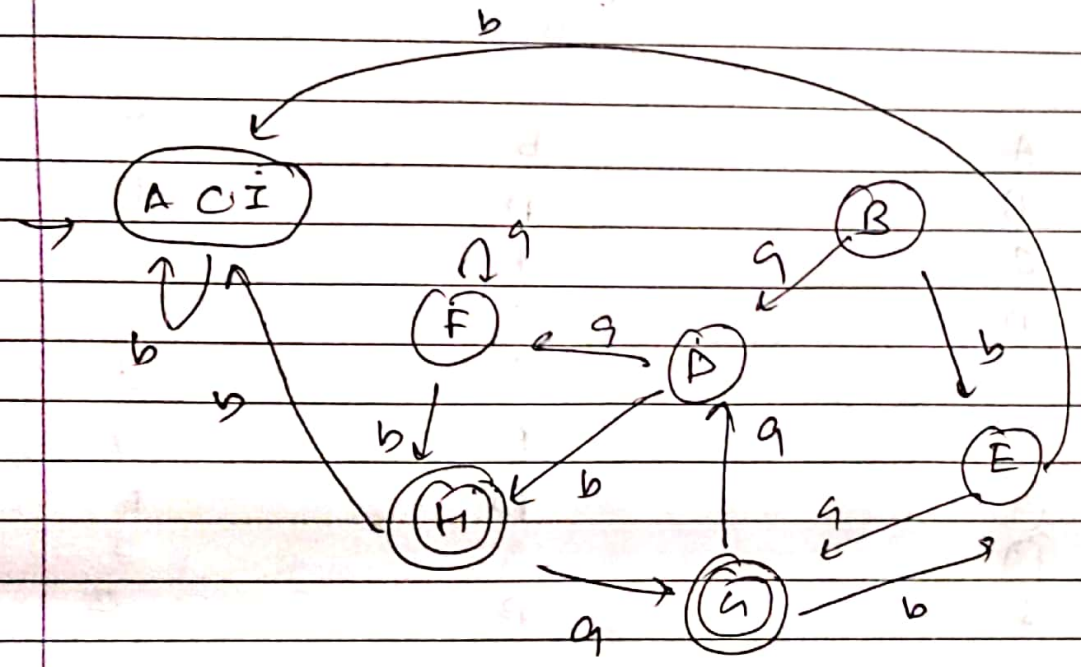
Subset

0 : (A B C D E I) (F G H)

1 : (A B C, I) (D) (E) (F) (G) (H)

2 : (A C I) (F) (G) (H)
(B) (D) (E)

3 : (A C I) (B) (D) (E) (F) (G) (H)



[(a|b)* a (a|b) (a|b)]

Q3) Types of lexical Errors

① EXCEEDING LENGTH of IDENTIFIER

int a = 2147836477 ;

→ as integer lies between ∓2147843648

Hence, it is a lexical error.

② Appearance of illegal characters

printf("Hello"); $ → illegal character

③ Unmatched String

/* Comment
cout<< "H";
return 0;

→ '*/' is not found Hence comment is not complete.

4 Spelling Error

```
int 3num = 5;
    ↳ error
```

→ Variable names cannot start with 'numbers' hence spelling error.

(5) Replacing a character with an wrong character

```
int x = 12 $3;
```

$ is not assignable to int as it is not in (0-9) range.

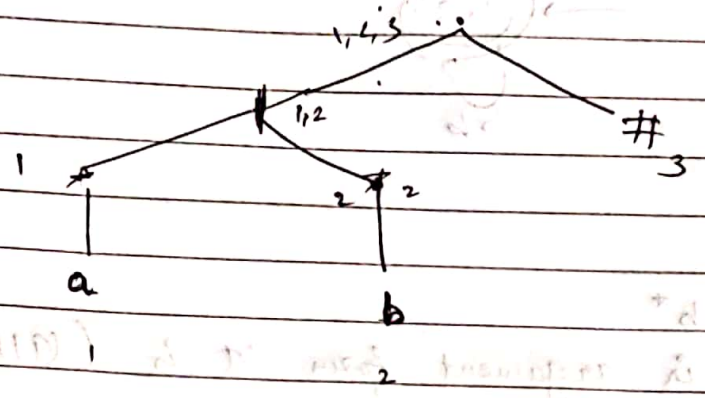
(6) Removal of character that should be present

(7) Transposition of 2 characters

Q. Minimum State DFA using (firstPos, lastPs, followPs)

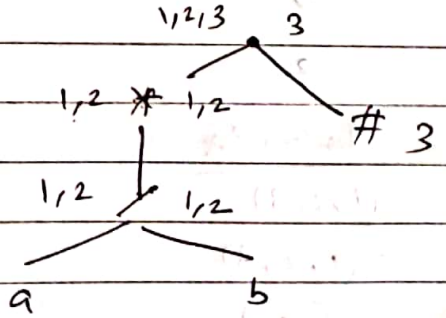
① a^*/b^*

$(a^*/b^*)\#$



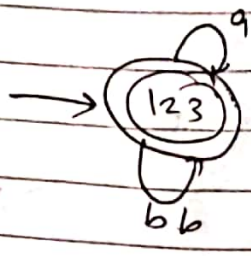
	node	follow pos
a	1	{1,3}
b	2	{2,3}
#	3	{}

② $(a^*b^*)^*$ ≡ $(a|b)^*$



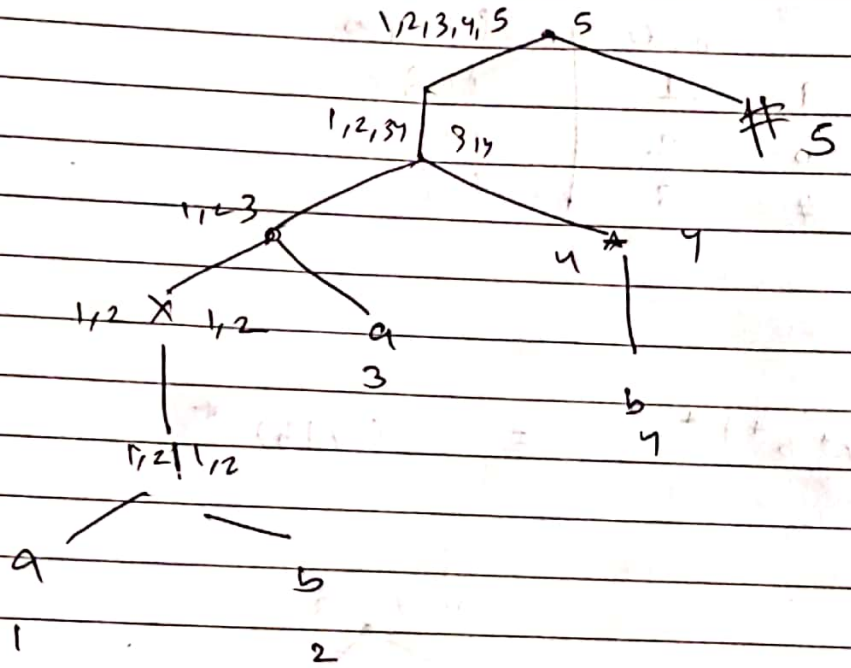
	node	followpos
a	1	{1,2,3}
b	2	{1,2,3}
#	3	{}

DFA :-



3. $(a|b)^* a|b^*$

in argument form it is $((a|b)^* a|b^*)$#



	node	followpos
a	1	(1,2,3)
b	2	(1,2,3)
a	3	(5)
b	4	{4,5}
#	5	

(DFA)