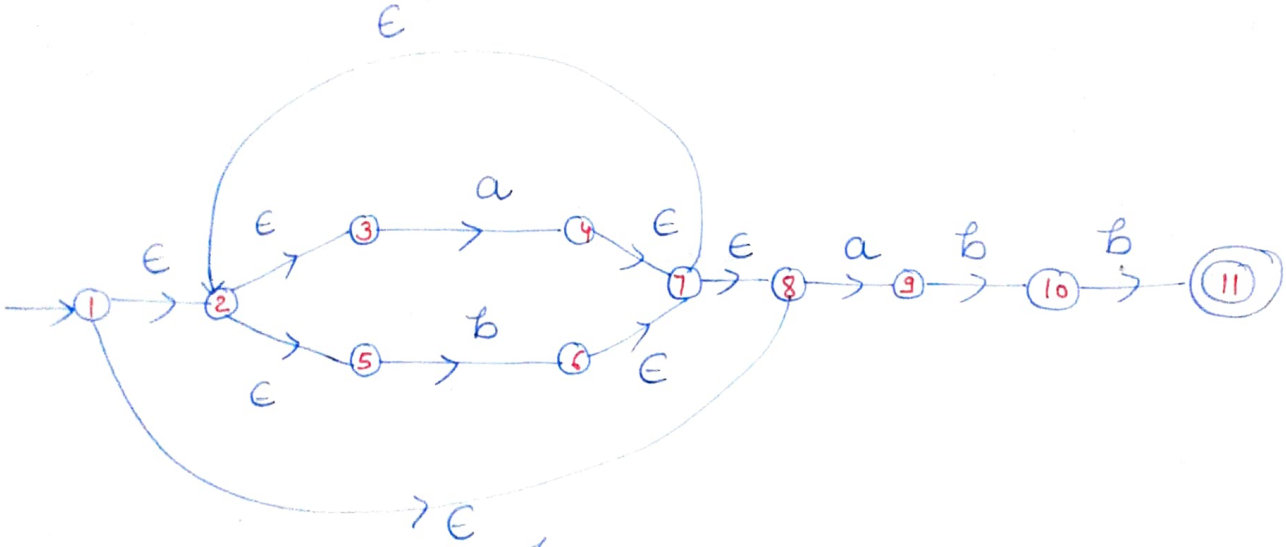
Ques-4 Convert regular Expression $(a/b)^*abb$ to minimised DFA.

Answer - **Step-1** Convert regular expression $(a/b)^*abb$ using thompson construct method.



Syntax Tree

Step-2 Convert the given NFA to DFA using subset construction method.

(*) find ϵ-closure(s).

so, start with initial state (1)

ϵ-closure(1) = {1, 8, 2, 3, 5}

= {1, 2, 3, 5, 8} - - - (A)

→ to find the transition of (A) state of the input symbol (a,b)

transition δ(A, a) and δ(A, b)

state A = {1, 2, 3, 5, 8}

Now, check the symbol (a) is leaving out from any state.

δ(A, a) = {4, 9} | a on A: 3 —a→ 4 & 8 —a→ 9 (1)

* find ϵ-closure (4, 9) = {4, 9, 7, 8, 2, 3, 5} --- (B)
{2, 3, 4, 5, 7, 8, 9} --- (B)

Then, check the symbol (b) is leaving out from any state.

δ(A, b) = {6} / 5 —b→ 6 b on A.

* find ϵ-closure (6) = {6, 7, 8, 2, 3, 5}
{2, 3, 5, 6, 7, 8} --- (C)

→ To find the transition of (B) state of input symbol (a, b)
Transition δ(B, a) and δ(B, b)

Now, check ~~state of B~~ State B = {2, 3, 4, 5, 7, 8, 9}
the symbol (a) is leaving out from any state.

δ(B, a) = {4, 9}

We have already find the ϵ-closure of (4, 9) that's a state (B)

Then, check the symbol (b) is leaving out from any state.

δ(B, b) = {6, 10} / b on B: 5 —b→ 6 & 9 —b→ 10

* find ϵ-closure (6, 10) = {6, 10, 7, 8, 2, 3, 5}
= {2, 3, 5, 6, 7, 8, 10} --- (D)

→ To find the transition of (C) State of input symbol (a, b)
Transition δ(C, a) and δ(C, b)

State C = {2, 3, 5, 6, 7, 8}

Now, check the symbol (a) is leaving out from any state.

δ(C, a) = {4, 9}

We have already find the ϵ-closure of (4, 5), that's a state (B)

Then, check the symbol (b) is leaving out from any state.

δ(C, b) = {6}

We have already found the ϵ-closure of (6 that's a state (C)

→ To find the transition of (D) state of input symbol (a, b)
Transition $\delta(D, a)$ and $\delta(D, b)$

State D = {2, 3, 5, 6, 7, 8, 10}

Now, check the symbol (a) is leaving out from any state.

$\delta(D, a) = \{4, 9\}$

We have already find ε-closure (4, 9). That's a state (B)

Then, check the symbol (b) is leaving out from any state.

$\delta(D, b) = \{6, 11\}$

(+) find ε-closure of (6, 11)

ε-closure (6, 11) = {6, 11, 7, 8, 2, 3, 5}
= {2, 3, 5, 6, 7, 8, 11} --- (E)

→ To find the transition of (D) state of input symbol (a, b)
Transition $\delta(E, a)$ and $\delta(E, b)$

State E = {2, 3, 5, 6, 7, 8, 11}

Now, check the symbol (a) is leaving out from any state.

$\delta(E, a) = \{4, 9\}$ | a on E
$3 \xrightarrow{a} 4$ & $8 \xrightarrow{a} 9$

We have already found the ε-closure (4, 9). That's a state (B)

Then, check the symbol (b) is leaving out from any state.

$\delta(E, b) = \{6\}$

We have already found ε-closure (6). That is a state (C)

Transition Table

State Q	Input a	Input b
→ A = {1,2,3,5,8}	B	C
B = {2,3,4,5,7,8,9}	B	D
C = {2,3,5,6,7,8}	B	C
D = {2,3,5,6,7,8,10}	B	E
(E) = {2,3,5,6,7,8,11}	B	C

0 Equivalance = {A,B,C,D}, {E}
TTO

1 Eq = {A, B, C}, {D}, {E}
π_1

~~2 Eq(π_2) = {A} {B}, {D}, {E}~~

2 Eq(π_2) = {A, C}, {B}, {D}, {E}

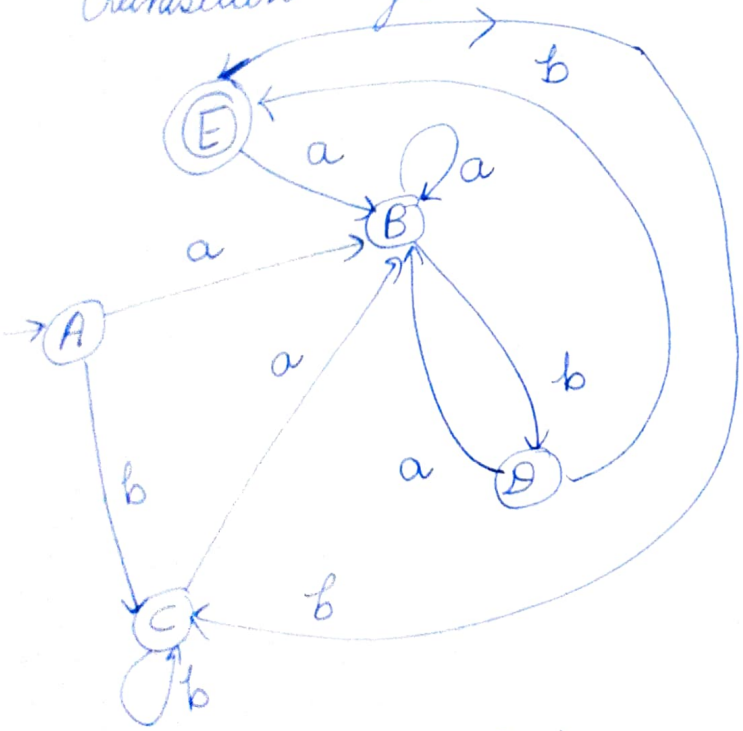
3 Eq(π_3) = {A, C}, {B}, {D}, {E}

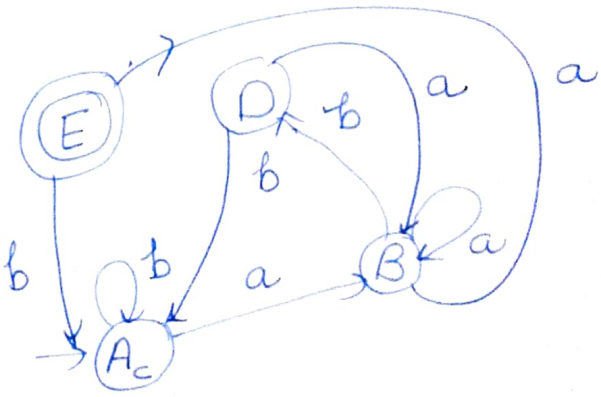
→ After Minimization Construct Transition table & Digram

Transition Table

State Q	Input a	Input b
→ A_C	B	A_C
B	B	D
D	B	A_C
(E)	B	A_C

Transition Digram





Accepting state in NFA is I1

I1 is element of E state, so E state is also final state in DFA

Transition (E) Digram

Steps Minimization Process

(*) remove unreable state.