CS19641 - COMPILER DESIGN

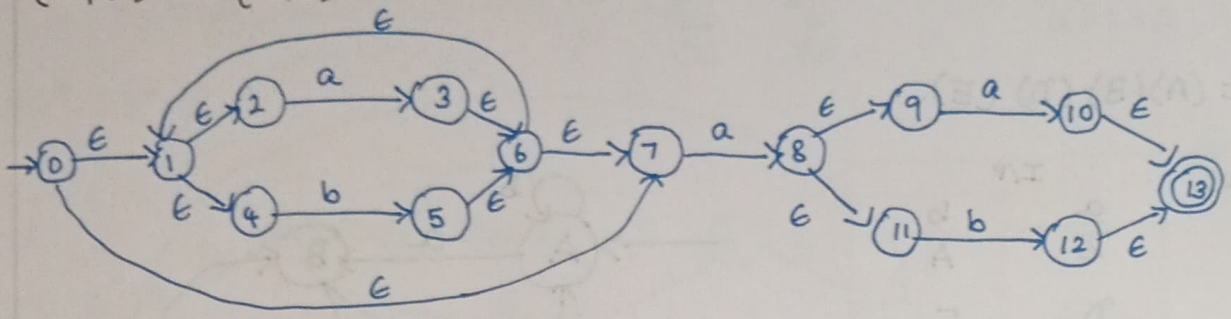
Assignment - II

NAME : SOWMIYA S

REG.No: 210701255

DEPT : III / CSE - D

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



ε-Closure {0} = {0, 1, 2, 4, 7} — (A).

A, a = {3, 8} — (B).

A, b = {5} — (C).

ε-Closure {3, 8} = {3, 6, 7, 1, 2, 4, 8, 9, 11} — (B).

B, a = {3, 8, 10} — (D).

B, b = {5, 12} — (E).

ε-Closure {5} = {5, 6, 7, 1, 2, 4} — (C).

C, a = {3, 8} — (B).

C, b = {5} — (C).

ε-Closure {3, 8, 10} = {3, 6, 7, 1, 2, 4, 8, 9, 11, 10, 13} — (D).

D, a = {3, 8, 10} — (D).

D, b = {5, 12} — (E).

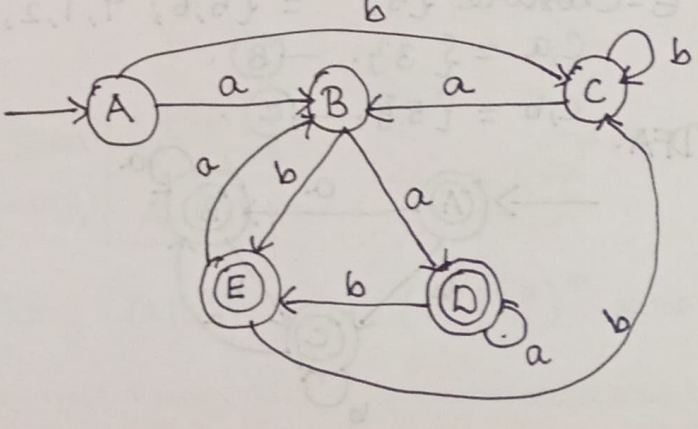
ε-Closure {5, 12} = {5, 6, 7, 1, 2, 4, 12, 13} — (E).

E, a = {3, 8} — (B).

E, b = {5} — (C).

DFA:

States	I/P	
	a	b
→A	B	C
B	D	E
C	B	C
*D	D	E
*E	B	C



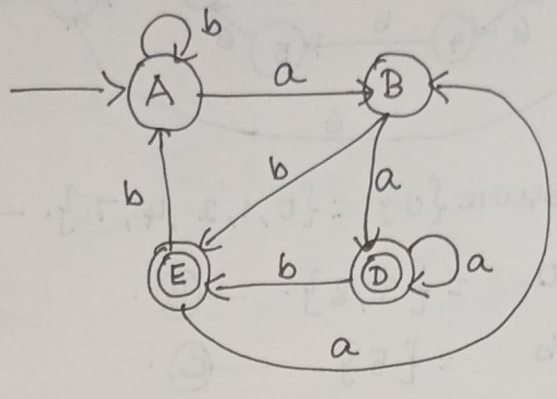
Minimized DFA:

$P_0 = (ABC)(DE)$ — ABC: a → BDB, b → CEC; DE: a → DB, b → EC

$P_1 = (AC)(B)(D)(E)$. ($\because A == C$) — AC: a → BB, b → CC

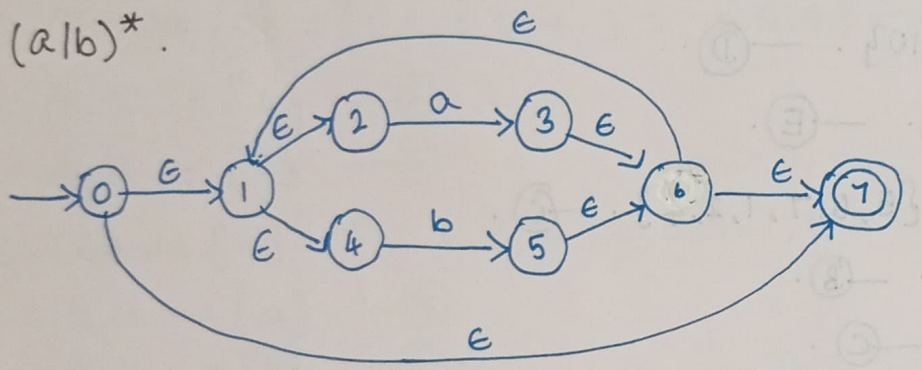
$P_2 = (A)(B)(D)(E)$.

States	I/P	
	a	b
→A	B	A
B	D	E
* D	D	E
* E	B	A



2.

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



ε-Closure {0} = {0, 1, 2, 4, 7} · — (A)

A, a = {3} · — (B)

A, b = {5} · — (C)

ε-Closure {3} = {3, 6, 1, 2, 4, 7} · — (B)

B, a = {3} · — (B)

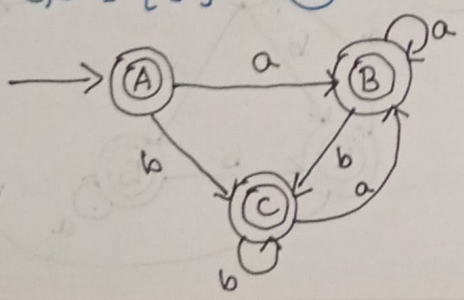
B, b = {5} · — (C)

ε-Closure {5} = {5, 6, 7, 1, 2, 4} · — (C)

C, a = {3} · — (B)

C, b = {5} · — (C)

DFA:



States	I/P	
	a	b
→*A	B	C
*B	B	C
*C	B	C

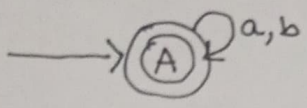
Minimized DFA: ABC — ABC

$P_0 = (ABC)$. (a: ABC → BBB; b: ABC → CCC)

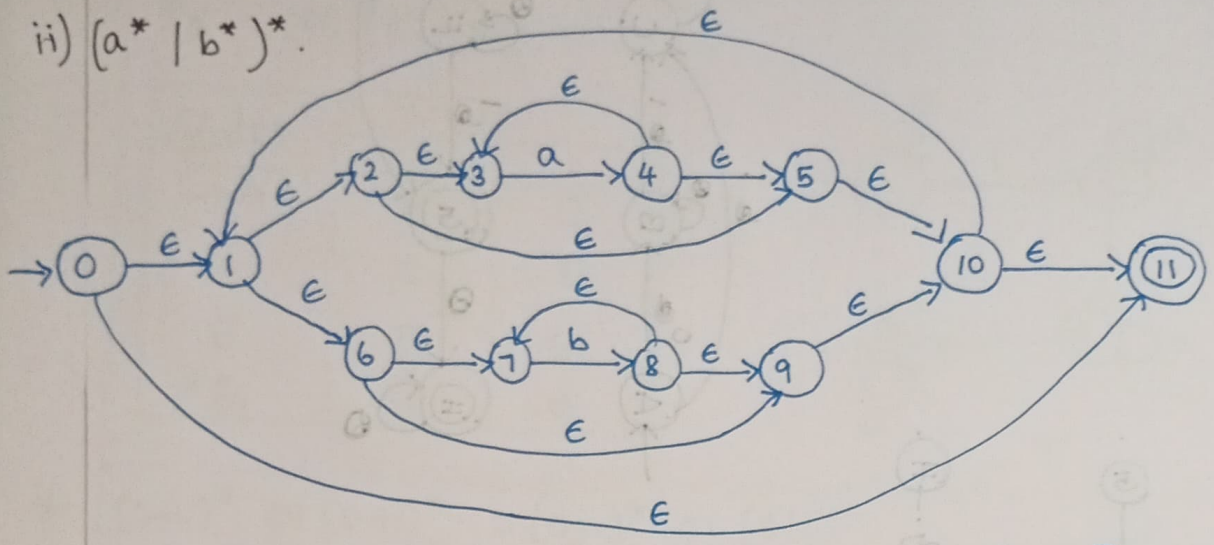
$(\because A = B = C)$.

$\therefore P_1 = A$.

States	I/P	
	a	b
→*A	A	A



ii) $(a^* \mid b^*)^*$.



ε-Closure {0} = {0, 1, 2, 6, 7, 3, 5, 10, 11, 9} — (A).

A, a = {4} — (B).

A, b = {8} — (C).

ε-Closure {4} = {4, 3, 5, 10, 1, 2, 6, 9, 7, 11} — (B).

B, a = {4} — (B).

B, b = {8} — (C).

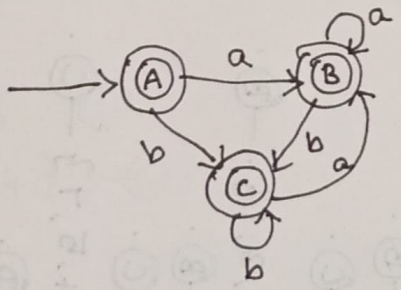
ε-Closure {8} = {8, 9, 7, 10, 11, 1, 2, 3, 5, 6} — (C).

C, a = {4} — (B).

C, b = {8} — (C).

DFA:

States	I/P	
	a	b
→*A	B	C
*B	B	C
*C	B	C



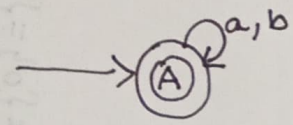
Minimized DFA: ABC — ABC

$P_0 = (ABC)$. (a: ABC → BBB; b: ABC → CCC)

$(\because A = B = C)$

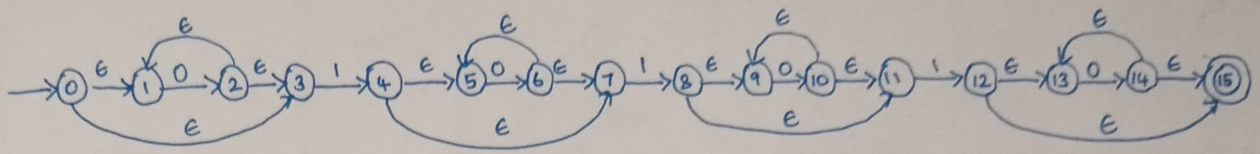
$\therefore P_1 = A$.

States	I/P	
	a	b
→*A	A	A



∴ The DFA of the two RE $(a|b)^*$ and $(a^* \mid b^*)^*$ are equivalent.

3. 0*10*10*10*



ε-Closure {0} = {0, 1, 3} — (A).

A, 0 = {2} — (B).

A, 1 = {4} — (C).

ε-Closure {2} = {2, 3, 1} — (B).

B, 0 = {2} — (B).

B, 1 = {4} — (C).

ε-Closure {4} = {4, 5, 7} — (C).

C, 0 = {6} — (D).

C, 1 = {8} — (E).

ε-Closure {6} = {6, 7, 5} — (D).

D, 0 = {6} — (D).

D, 1 = {8} — (E).

ε-Closure {8} = {8, 9, 11} — (E).

E, 0 = {10} — (F).

E, 1 = {12} — (G).

ε-Closure {10} = {10, 11, 9} — (F).

F, 0 = {10} — (F).

F, 1 = {12} — (G).

ε-Closure {12} = {12, 15, 13} — (G).

G, 0 = {14} — (H).

G, 1 = ϕ.

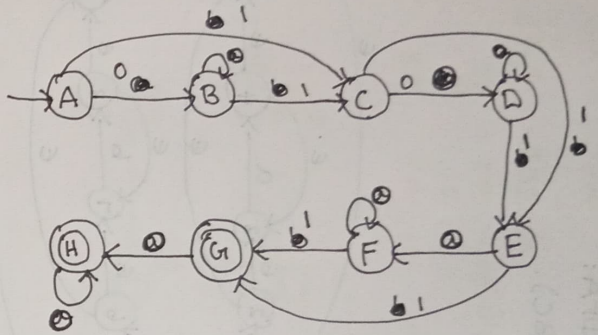
ε-Closure {14} = {14, 15, 13} — (H).

H, 0 = {14} — (H).

H, 1 = ϕ.

DFA:

States	I/P 0	I/P 1
→A	B	C
B	B	C
C	D	E
D	D	E
E	F	G
F	F	G
*G	H	ϕ
*H	H	ϕ



Minimized DFA:

$P_0 = (ABCDEF)(GH)$.

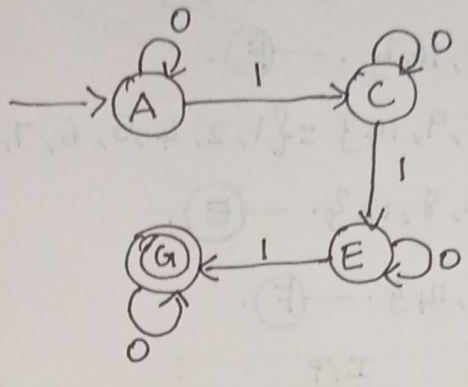
ABCDEF ABCDEF GH GH
⇓0 ⇓1 ⇓0 ⇓1
BBDDFF CCEEGG HH ϕϕ

$P_1 = (AB)(CD)(EF)(GH)$. ($\because A=B$) ($\because C=D$) ($\because E=F$) ($\because G=H$)

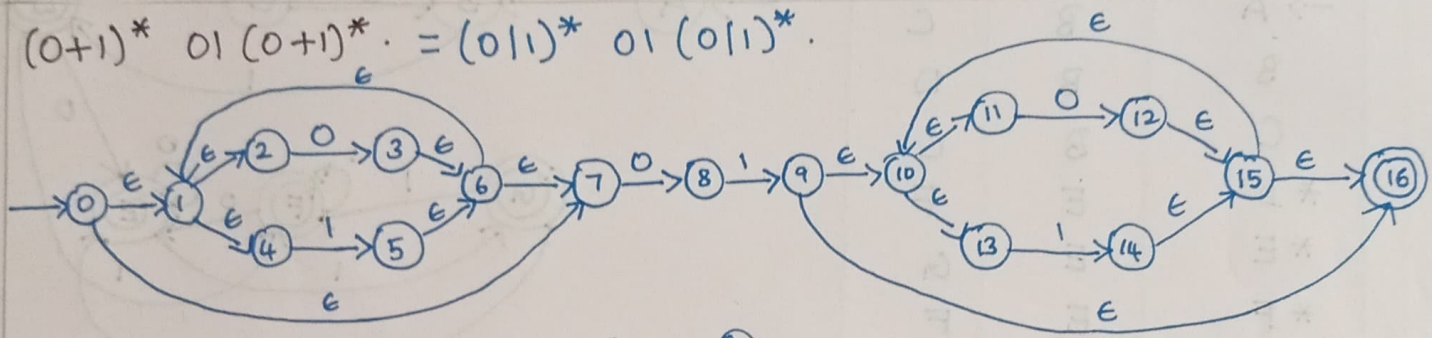
AB CD EF AB CD EF
⇓0 ⇓0 ⇓0 ⇓1 ⇓1 ⇓1
BB DD FF CC EE GG

$P_2 = (A)(C)(E)(G)$.

States	I/P	
	0	1
→A	A	C
C	C	E
E	E	G
*G	G	ϕ



4. $(0+1)^*\ 01\ (0+1)^* = (0|1)^*\ 01\ (0|1)^*$.



ϵ-Closure {0} = {0, 1, 7, 2, 4} — (A).

A, 0 = ~~{3}~~ ~~(B)~~. {3, 8} — (B).

A, 1 = {5} — (C).

ϵ-Closure {3, 8} = {3, 6, 7, 1, 2, 4 ~~, 8~~ ~~(B)~~, 8} — (B).

B, 0 = {3, 8} — (B).

B, 1 = ~~{5}~~ ~~(C)~~. {5, 9} — (D).

ϵ-Closure {5} = {5, 6, 7, 1, 2, 4} — (C).

C, 0 = {3, 8} — (B).

C, 1 = {5} — (C).

ϵ-Closure {5, 9} = {5, 6, 7, 1, 2, 4, 9, 10, 11, 13, 16} — (D).

D, 0 = {3, 8, 12} — (E).

D, 1 = {5, 14} — (F).

ϵ-Closure $\{3,8,12\} = \{1,2,3,4,6,7,8,12,15,16,10,11,13\}$ → (E).

E,0 = {3, 8, 12} → (E).

E,1 = {5, 9, 14} → (G).

ϵ-Closure $\{5,14\} = \{1,2,4,5,6,7,10,11,13,14,15,16\}$ → (F).

F,0 = {3, 8, 12} → (E).

F,1 = {5, 14} → (F).

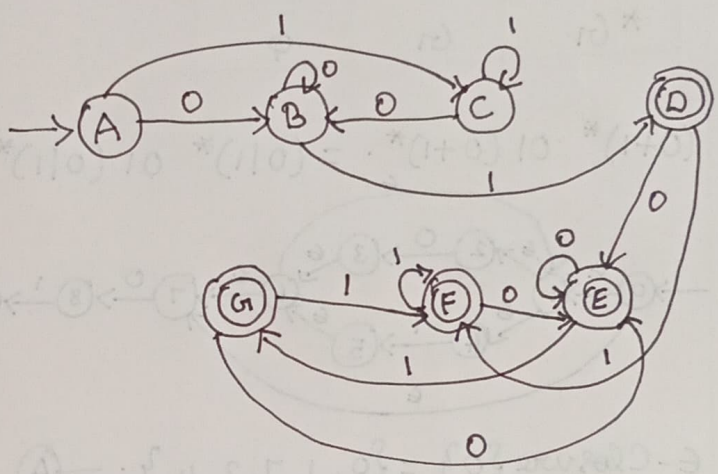
ϵ-Closure $\{5,9,14\} = \{1,2,4,5,6,7,9,10,11,13,14,15,16\}$ → (G1).

G1,0 = {3, 8, 12} → (E).

G1,1 = {5, 14} → (F).

DFA:

States	I/P	
	0	1
→ A	B	C
B	B	D
C	B	C
*D	E	F
*E	E	G
*F	E	F
*G1	E	F



Minimized DFA:

$P_0 = (ABC)(DEFG1)$.

ABC: 0 → BBB; 1 → CDC

DEFG1: 0 → EEEE; 1 → FG1FF

$P_1 = (AC)(B)(DFG1)(E)$.

(∵ A=C) (∵ D=F=G1)

AC: 0 → BB; 1 → CC

DFG1: 0 → EEE; 1 → FFF

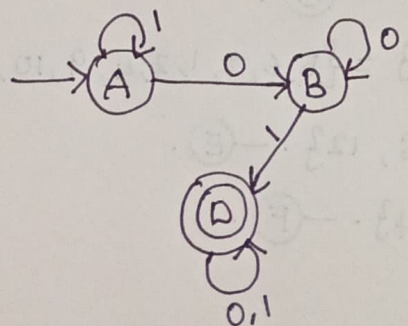
$P_2 = (A)(B)(D)(E)$.

(∵ D=E)

DE: 0 → EE; 1 → DD

$P_3 = (A)(B)(D)$.

States	I/P	
	0	1
→ A	B	A
B	B	D
*D	D	D



5. $(0|1)^+$. $= (0|1)\,(0|1)^*$.

NFA: