

Q # 01:

1. Contain Exactly 2 a's

$$b^*ab^*ab^*$$

2. Atleast 2 a's

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

3. does not end with ab

$$(a+b)^*(aa+bb+ba)+a+b+\Lambda$$
$$(a+b)^*(a+bb)$$

4. begin or end with aa or bb

$$(aa+bb)(a+b)^*(a+b)^*(a+b)+aa+bb$$

5. Not Containing aa as substring

$$b^*(ab)^* \text{ or } (b+ab)^*(a+\Lambda)$$

6. String with even number of a's

$$(b+ab^2a)^*$$

7. Every a is followed by bb

$$(b+abb)^*$$

8. String containing both bb and aba

$$(a+b)^*bb(a+b)^*aba(a+b)^* + (a+b)^*aba(a+b)^*bb(a+b)^*$$

9. Not containing aaa as substring

$$(b+ab+aab)^*(a+aa+\Lambda)$$

10. Not containing bba substring

$$(a+ba)^*[a+b(a+b)^*]$$

11. Contains both bab and aba

$$(a+b)^*bab(a+b)^*aba(a+b)^* + (a+b)^*aba(a+b)^*bab(a+b)^*$$

Q# 02:

$$[(aa+bb)+(ab+ba)(aa+bb)^*(ab+ba)]^*$$

a) aabbabaaabbbbaaa

1. $[(aa+bb)+(ab+ba)(aa+bb)^*(ab+ba)]^*$

outer 1 inner 0

3. outer 3 inner 2

aabbabaaabbbba

aa

4. outer 4 inner 0

2. outer 2 inner 0

aabbabaaabbbbaaa

aabb

Overall:

$$[(aa+bb)+(ab+ba)(aa+bb)^2(ab+ba)]^4$$

b) $abaabbbbaabbbaa$

1. Outer 1 inner 1 Overall

$abaa$

2. Outer 1 inner 2 $[(aa+bb)+(ab+ba)(aa+bb)^*(ab+ba)]^*$

$abaabbbba$

3. Outer 2 inner 2

$abaabbbbaabbba$

4. Outer 3 inner 2

$abaabbbbaabbbaa$

2 $(aa+aab)^*b$

Values of stars for $aaabaabbb$

$(aa+aab)^3b$ it's 3

Q # 03:

Generate 5 valid Strings

$Sdd^*(\wedge+pd^*)(\wedge+Esdd^*)$

1. +45

2. 123

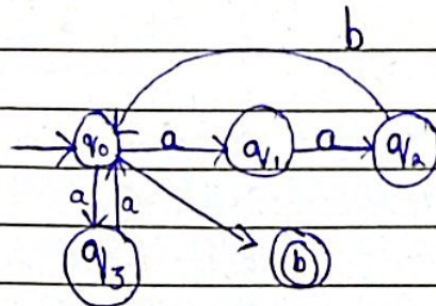
3. -12.3

4. -3.14E+10

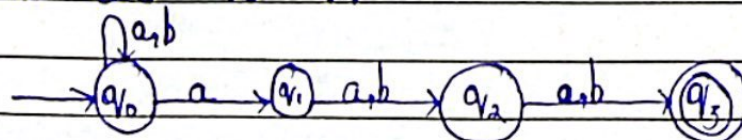
5. 0.99E-5

Q# 04:

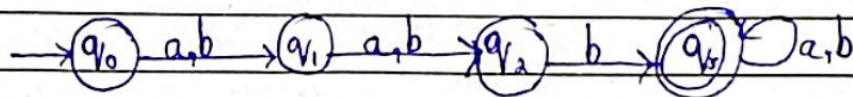
a) $\{ea+aab\}^* \{b\}$



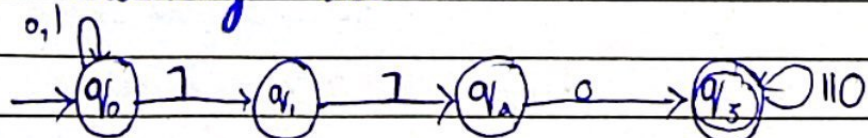
b) 3rd last is A



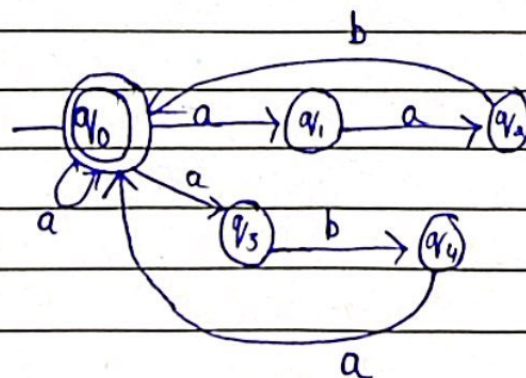
c) 3rd letter is B



d) Have substring 110



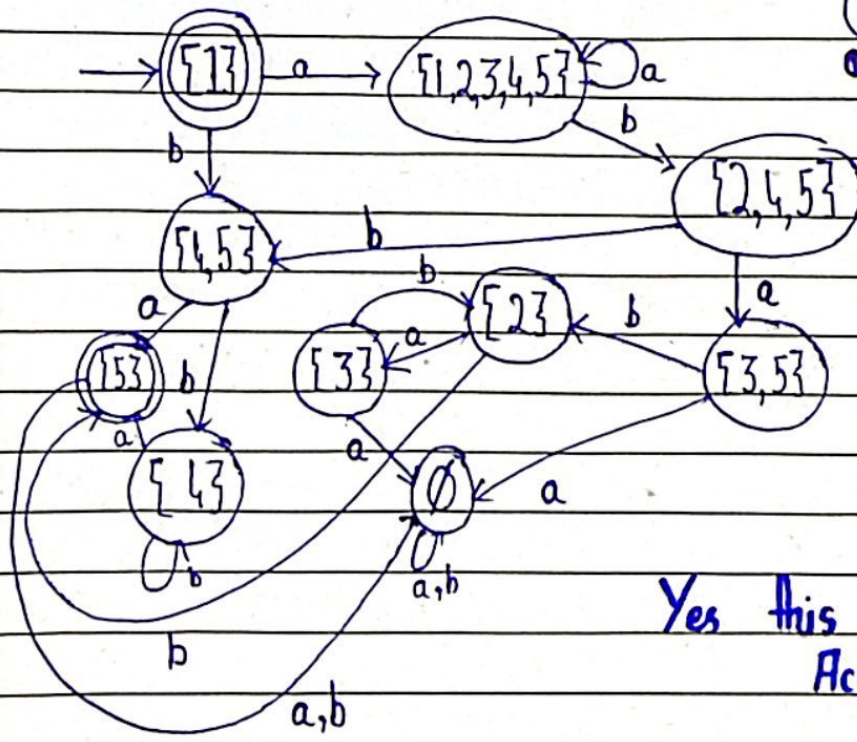
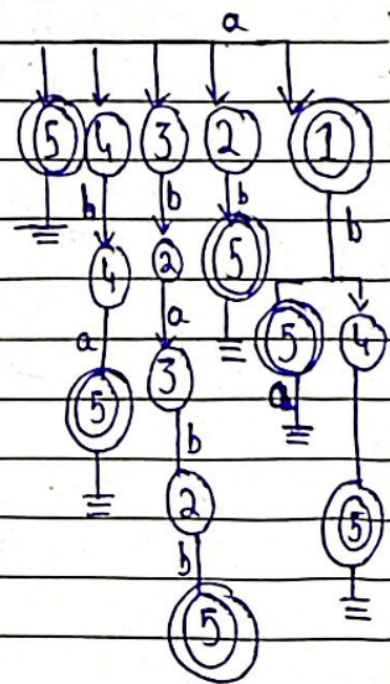
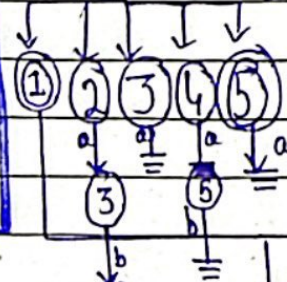
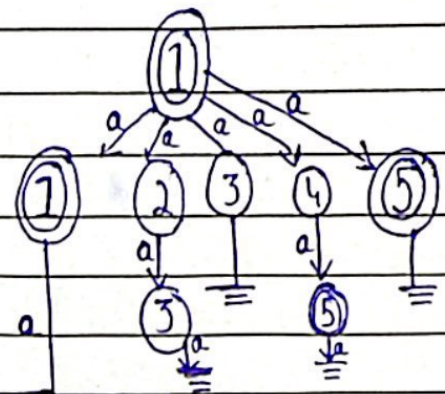
e) $\{aab\}^* \{a,aba\}^*$



6-Convert NFA to DFA String

q	$S(q,a)$	$S(q,b)$
→ 1	{1,2,3,4,5}	{4,5}
2	{3}	{5}
3	\emptyset	{2}
4	{5}	{4}
+ 5	\emptyset	\emptyset
Extra		
{1,2,3,4,5}	{1,2,3,4,5}	{2,4,5}
{2,4,5}	{3,5}	{4,5}
{3,5}	\emptyset	{2}
{4,5}	{5}	{4}

aaabbbb



Yes this String is Accepted

Q

 $S(a, a)$ $S(a, b)$

→ 1

{2, 3}

 \emptyset

2

{2, 3}

 \emptyset

3

 \emptyset

{1, 2, 4}

4

{2, 3}

{5}

5

{1, 2, 4}

 \emptyset

extm

{2, 3}

{2, 5}

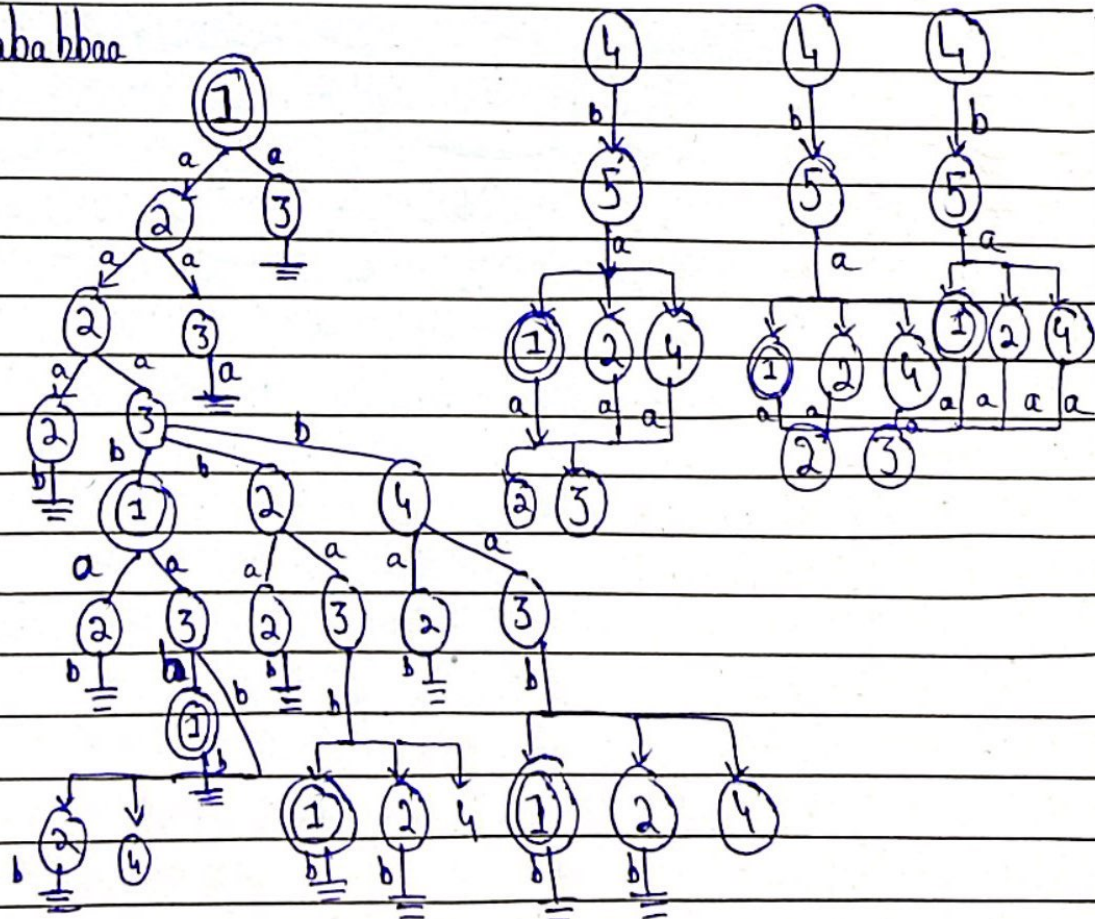
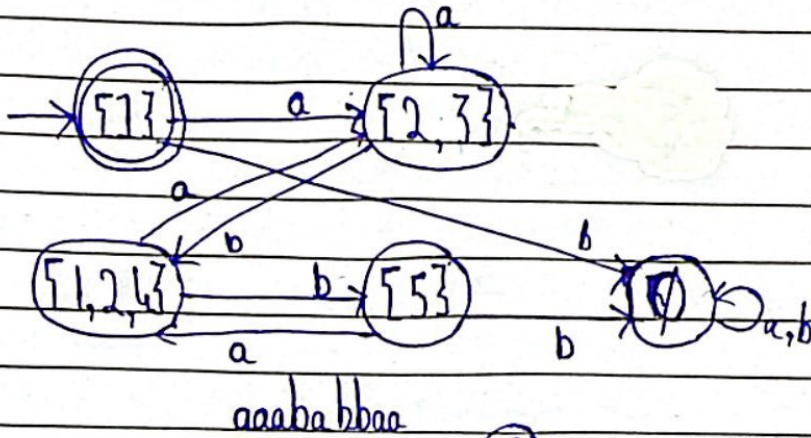
{1, 2, 4}

This String not Accepted

{1, 2, 4}

{2, 3}

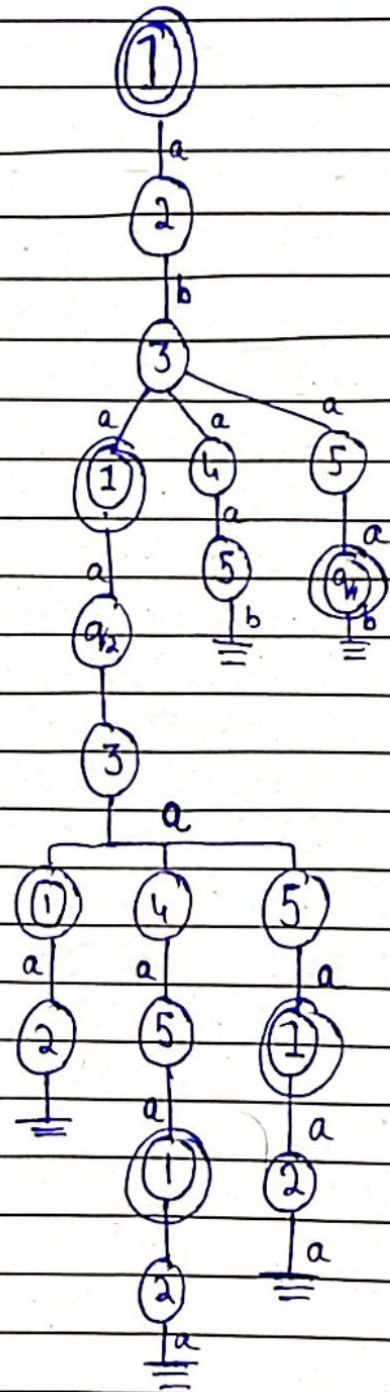
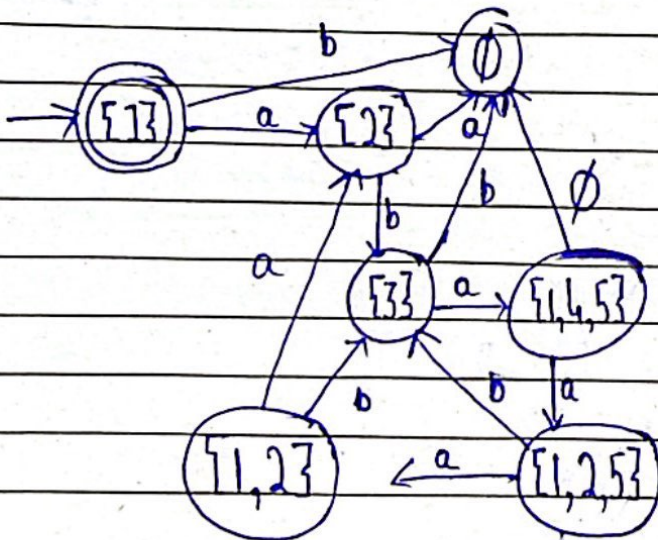
{5}



3)

a	$S(a, a)$	$S(a, b)$
$\rightarrow +1$	$\{2\}$	\emptyset
2	\emptyset	$\{3\}$
3	$\{4, 5, 1\}$	\emptyset
4	$\{5\}$	\emptyset
5	$\{1\}$	\emptyset

$\{1,4,5\}$	$\{1,2,5\}$	\emptyset
$\{1,2,5\}$	$\{1,2\}$	$\{3\}$
$\{1,2\}$	$\{2\}$	$\{3\}$



This String not Accepted