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Semester :- 5 subject :- TCS.
Seat No :- CS5A021
Pg No :- 1/6. of ~~8~~ 92. Sign :- K. Kalani.

A). We have following productions

S → aB (Rule 1)
S → bA (Rule 2)
A → a (Rule 3)
A → aS (Rule 4)
A → bAA (Rule 5)
B → b (Rule 6)
B → bS (Rule 7)
B → aBB (Rule 8).

Lets generate leftmost derivation for string 'bbaaabbaba'

S → bA (Rule 2)
S → bbAA (Rule 5)
S → bbaSA (Rule 4)
S → bbaaBA (Rule 1)
S → bbaaaBBA (Rule 8)
S → bbaaabSBA (Rule 7)
S → bbaaabbABA. (Rule 2)
S → bbaaabbaBA. (Rule 3)
S → bbaaabbabA. (Rule 6)
S → bbaaabbaba. (Rule 3).

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pg No :- 2/6. of Q2.

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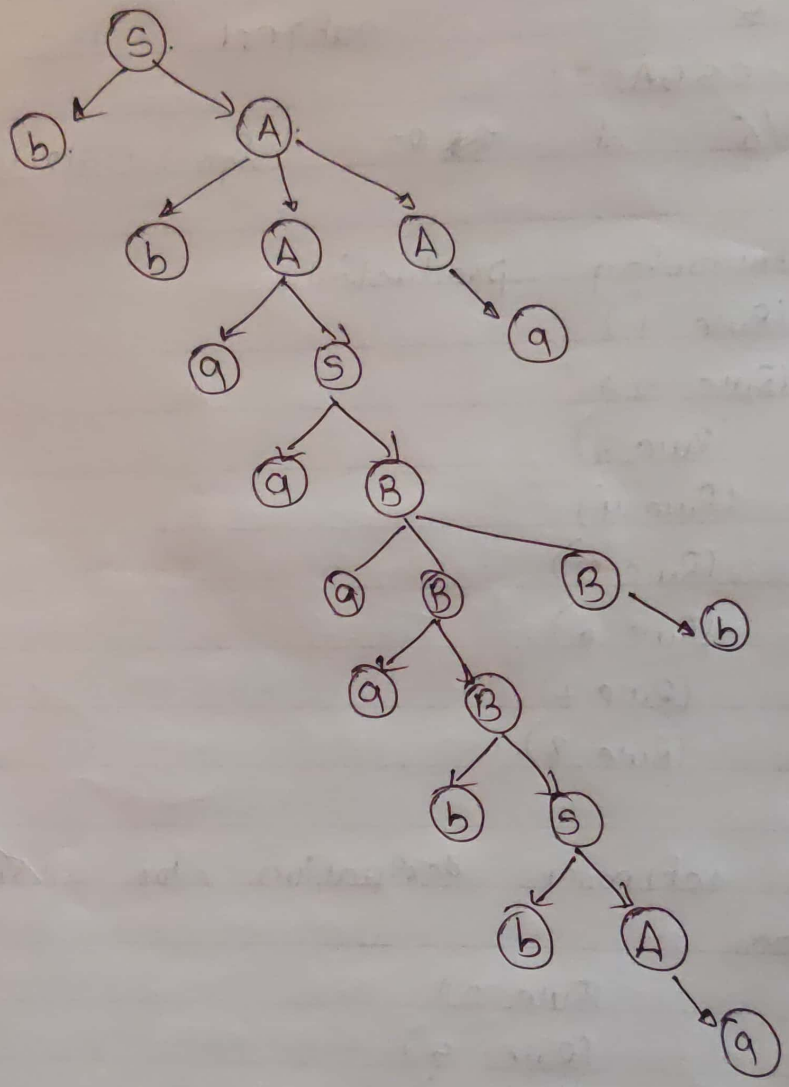

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A). Lets generate rightmost derivation for string bbaaabbaba.

S → bA.	(Rule 2)
S → bbAA.	(Rule 5)
S → bbAa.	(Rule 3)
S → bbaSa	(Rule 4)
S → bbaaBa	(Rule 1)
S → bbaaaBaBa	(Rule 8)
S → bbaaaBba	(Rule 6)
S → bbaaabSba	(Rule 7)
S → bbaaabbAba	(Rule 2)
S → bbaaabbaba	(Rule 3).

B). The language becomes
L = { abb , aabbb , aaabbbb , aaaabbbb , ... }

Logic :-

i) Each 'a' is replaced by 'x' and head movement towards right till 'b'

ii) Each 'b' is replaced by 'y' and head movement towards left till 'x'

iii) Repeat above two steps till 'a's and b's are over.

iv) For last 'b' make it blank.

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B). Implementation :-

let $M = (Q, \Sigma, \Gamma, \delta, q_0, B, F)$

where

$Q = [q_0, q_1, q_2, q_3, q_4, q_5]$

$\Sigma = [a, b]$

$\Gamma = [a, b, X, Y, B]$

$q_0 = q_0$

B : Blank Symbol

$F = [q_5]$

Working :-

q_0 :- Replace 'a' by 'X' and head moves towards right.

q_1 :- Search for 'b' and Replace it by 'Y' and head moves towards left, Bypass all 'a's and 'Y's

q_2 :- Bypass all 'a's and 'Y's. Search for 'X' and replace it by 'X' only and head moves towards right whenever get 'a' at q_0 state repeat this cycle for all 'a' and 'b's.

q_x :- On q_0 state if we get 'Y' replace it by 'Y' only and head moves towards right now move the head right to search for last 'b'. Bypass all 'Y's

q_3 :- On q_0 state if we get 'Y' replace it by 'Y' only and head moves towards right. Now, move the head right to search for last 'b'. Bypass all 'Y's.

q_4 :- After all 'Y's if we get 'b' this indicates one extra 'b' than 'a' is found.

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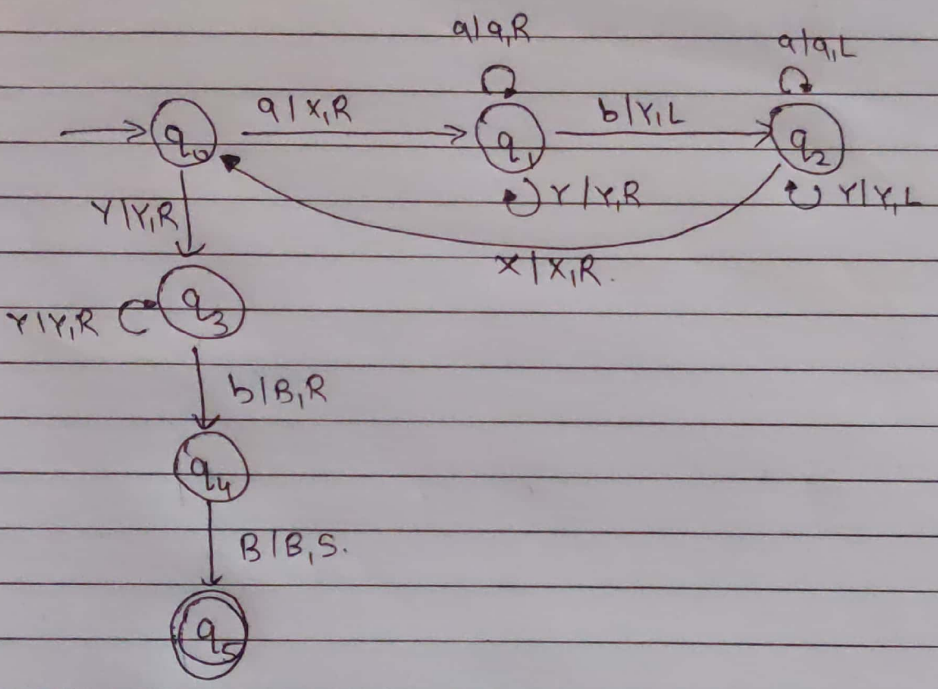
B). q_5 :- After the last 'b' if we get blank symbol means no more 'b's are remaining.

Transition diagram :-



Transition table :-

Q/Σ	a	b.	X	Y	B
→ q_0	(q_1, X, R)	-	-	(q_1, Y, R)	-
q_1	(q_1, a, R)	(q_2, Y, L)	-	(q_1, Y, R)	-
q_2	(q_2, a, L)	-	(q_1, X, R)	(q_2, Y, L)	-
q_3	-	(q_4, B, R)	-	(q_3, Y, R)	-
q_4	-	-	-	-	(q_5, R, S)
q_5*	-	-	-	-	-

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Instantaneous description:-

$\vdash$ q0abbB	$\vdash$ Xq0YbB
$\vdash$ Xq1bbB	$\vdash$ XYq3bB
$\vdash$ Xq2YbB	$\vdash$ XYBq4B
$\vdash$ q2XYbB	$\vdash$ XYBq5 (Accept)