

4) String: a a b b a a #

$q_0: \downarrow a a b b a a \#$

$q_1: \# \downarrow a b b a a \#$

$q_2: \# a \downarrow b b a a \#$

$q_3: \# a x \downarrow b a a \#$

$q_4: \# a x b \downarrow a a \#$

$q_5: \# a x b x \downarrow a \#$

$q_6: \# a x b x \downarrow a \#$

$q_7: \# a x b x a \#$

$q_8: \# a \downarrow x b x a \#$

$q_9: \# \downarrow a x b x a \#$

$q_{10}: \# \downarrow a x b x a \#$

$q_{11}: \# \downarrow a x b x a \#$

...

$q_1: \# x x \downarrow b x a \#$

$q_1: \# x x \downarrow b x a \#$

$q_2: \# x x x \downarrow x a \#$

$q_2: \# x x x x \downarrow a \#$

$q_3: \# x x x x x \downarrow \#$

$q_6: \# x x x x x \downarrow \#$

$q_6: \# x x x \downarrow x x \#$

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$q_6: \# x \downarrow x x x x \#$

$q_6: \# \downarrow x x x x x \#$

$q_6: \# \downarrow x x x x x \#$

q_{accept}

$\therefore a a b b a a \#$ accepted

7] Implementation level Strategy:

1. Start by giving a "#" blank symbol before ~~in~~ putting in the input string on the tape and the tape head starts on the first symbol of the input string.
2. Scan the input string left to right.
3. Whenever 'a' is encountered, replace it by 'X' and ^{after 'a'} for 'b' replace with 'Y'. Ignore the encounter X, Y.
4. During the scanning process, if there is more than two "b"s for a single "a", reject.
5. By scanning, when the tape head reaches a "#", it goes to left until it finds "#" and starts scan again to right if any "a" or "b" left scanning and repeating from steps 2.
6. if all the "a" and "b" marks are replaced, Accept.

Testing:

↓
a a a b b b b b b

↓ ↓
x a a b b b b b b

↓
x a a Y b b b b b

↓
x a a Y Y b b b b

↓
~~#~~ x a a Y Y b b b b #

↓
x a a Y Y b b b b

↓
x x a Y Y b b b b

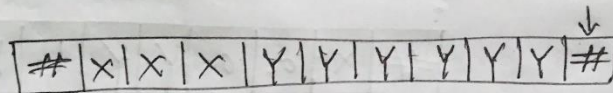
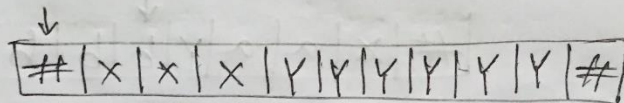
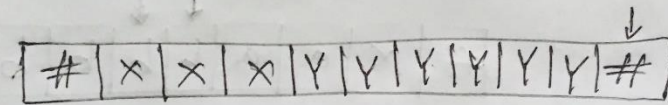
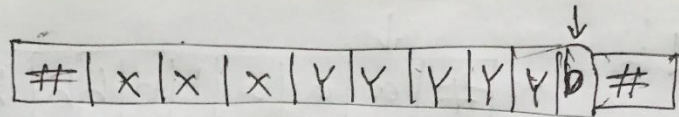
↓
x x a Y Y Y b b b

↓
x x a Y Y Y Y b b

↓
x x a Y Y Y Y b b

↓
x x a Y Y Y Y b b

↓
x x x Y Y Y Y b b



So, aaabbbb¹bb Accepted . The Algorithm
for the ~~machine~~ machine supports the provided string .