

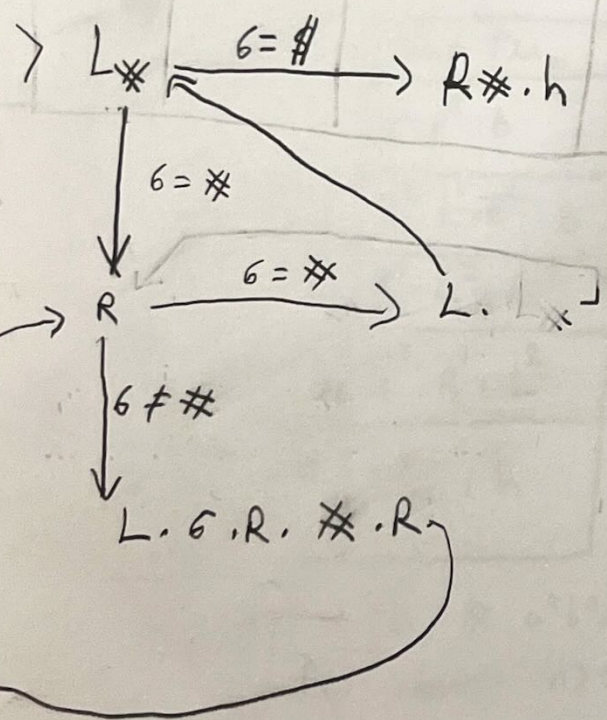
Question-1

CS-302 HW8

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Label	Condition	Next TM
>	-	$L^* . B$
B	$6 = \#$	$R^* . h$
B	$6 \neq \#$	$R . C$
C	$6 = \#$	$L . L^* . B$
C	$6 \neq \#$	$L . 6 . R . \# . R . C$

→ find the first blank in the left
→ if there is not halt
→ if there is check the right symbol
→ if it is blank skip both of them
→ if it is not blank shift the blank symbol on to right.



Question-2:

We modify M_1 such that instead of returning h_{yes} it returns h_p . h_p also corresponds to a state in M .
 $H(M_1) = \{h_p, h_{no}\}$

Label	Condition	Next TM
>	-	$R^1 . R^2 . B$
B	$6^1 = \#$	h_{yes}
B	$6^1 \neq \#$	C
C	$6^1 = x \neq \#$	$x^2 R^2 R^1 C$
C	$6^1 = x \neq \#$	$L^2 M_1$
C	$6^1 = x \neq \#$	$L^2 M_1$
h_p	-	$L^2 . R^2 . D$
D	$6^2 \neq \#$	$\#^2 . R^2 . D$
D	$6^2 = \#$	A

$H(M) = \{h_{yes}, h_{no}\}$
 * In the M the halt state of M_1 becomes a non-halt state.
 * In this machine we copy the input in the first state into the second state and check whether it is h_p . If it is h_p , the second state reset itself. The TM will halt when the first tape is empty.

Question-3

(i)

Label	Condition	Next TM
>	—	$R^1 \cdot R^2 \cdot L^1 \cdot B$
B	$G^1 = x \neq \#$	$x^2 \cdot R^2 \cdot L^1 \cdot B$
B	$G^1 = x = \#$	$R^1 \cdot L^2 \cdot R^2 \cdot C$
C	$G^2 = x \neq \#$	$x^1 \cdot R^1 \cdot R^2 \cdot C$
C	$G^2 = x = \#$	$L^1 \cdot h$

I will create a TM with 2 tapes. First tape will consist input at the beginning and the second tape will be empty.

we written in the tape = 2 we need to write it at the tape 1

(ii) I will create a TM with 2 tapes. First tape will be consist the string and the second tape will be empty. I will copy the elements in the tape 1 to tape 2. Later, I will add symbols at the end of tape 1 using tape 2.

Label	Condition	Next TM
>	—	$R^1 \cdot R^2 \cdot B$
B	$G^1 = x \neq \#$	$x^2 \cdot R^1 \cdot R^2 \cdot B$
B	$G^1 = x = \#$	$L^2 \cdot R^2 \cdot C$
C	$G^2 = x \neq \#$	$x^1 \cdot R^1 \cdot R^2 \cdot C$
C	$G^2 = x = \#$	$L^1 \cdot h$

Question-3

(iii) $(s, \#w) \vdash^* M (h, \#w\#w^R)$

I will create a TM with 2 tapes. First tape will consist the string and the second tape will be empty. I will firstly copy the symbols in the tape 1 to tape 2. Later, I will add symbols at the end of tape 1 using tape 2.

Label	Condition	Next TM
>	—	$R^1.R^2.B$
B	$b^1 = x \neq \#$	$x^2.R^1.R^2.B$
B	$b^1 = x = \#$	$R^1.L^2.C$
C	$b^2 = x \neq \#$	$x^1.R^1.L^2$
C	$b^2 = x \neq \#$ $\#$	$L^1.h$

(iv) $(s, \#w) \vdash^* M (h, \#a^n b^n)$ where the number of a's and b's equal to a fixed integer $n > 0$

* Again copy to second tape and use the copy.

Label	Condition	Next TM
>	—	$R^1.R^2.B$
B	$b^1 = x \neq \#$	$x^2.R^1.R^2.B$
B	$b^1 = x = \#$	$L^1.L^2.R^1.R^2.C$
C	$b^2 = x = a$	$x^1.R^1.R^2.C$
C	$b^2 = x \neq a \text{ and } \#$	$R^2.C$
C	$b^2 = x = \#$	$L^2.R^2.D$
D	$b^2 = x = b$	$x^1.R^1.R^2.D$
D	$b^2 = x \neq a \text{ and } x \neq \#$	$R^2.D$
D	$b^2 = x = \#$	$\#^1.L^1.h$

* rewrite the a's and b's into the tape 1 using tape 2