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Assignment - 2

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1. Construct M s.t
 $0^n \# 0^m \in L(M)$ iff n & m are
coprime

a) \vdash 00000000#000 BBB

i) ~~Find~~ Keep going right until
you meet 0 or #. If it is
#, go to b). Else mark
the 0 as 1. Now go right to
#

ii) Go to first 0. Mark it
as 1. If there is next
symbol is B, keep going
left and mark all 1's as 0
until you meet #.

iii) Go left to \vdash . Go to step
i).

b) \vdash 1111111#100 BBB

i) If there is no 1 after #,
goto c).

ii) Find first 0 and mark it
as \wedge . Copy all the 1s
between \vdash & # and write
it after \wedge . ~~change all~~

iii) Change all 1s between
& B to 0. Change # to
 \vdash , \wedge to #. Go to \vdash .
Go to a).

c) T I # O B B B

i) If there is only one 0 after #, accept.

ii) Else reject.

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2. Show that $f(n) = 2^{2^n}$ is total recursive. Input 0^n .

a) T O O B B B B B B

i) Find first B & mark it with # and then mark the next symbol as 0. Go left till T.

ii) Find first 0 before #. If there is none, go to b). Mark it T.

iii) For each 0, write a equivalent 1 at the first B symbol. Then mark the 0 as 1. Now go left till #. Rewrite all 1s as 0. Go left till T. Go to ii).

~~b) Mark the first T~~

b) T T T # O O O O B B B B

i) Mark the # as T.

ii) Repeat a) 1 time

iii) Stop.

Current state :- T T T T T T T # O O O O O O O O B B B B

\Rightarrow Since M halts for all inputs, $f(n) = 2^{2^n}$ is total recursive function

3) Show that $f(n) = m - n$ ($m \geq n$) is total recursive for input $0^m \# 0^n$.

a) $\vdash 00000 \# 000BBB \dots$

i) go to first 0 after $\#$. Mark it as 1. If there is no 0, Halt

ii) goto \vdash . Find 1st 0. Mark it as 1. Go to $\#$. Go to step i).

Current state: $\vdash 11100 \# 111BBB \dots$

~~The output~~ The no. of 0's remaining is $m - n$.

\therefore M halts for all inputs, $f(n) = m - n$ is total recursive function.

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