

Exam 2 - Correction

I - a) Prove that E_{DFA} is decidable

b) " " EQ " " " "

c) Prove that E_{Reg} (all empty Reg. Ex) is decidable

• Convert to ~~NFA~~ N , convert N to DFA A

• Run E_{DFA} on A

• if Accepts, accept, otherwise, reject.

II - using Diagonalization show that $B = \{\text{all infinite seqs over } \{0,1\}\}$ is undecidable.

- Assume it's decidable

- there exist f with correspondence

Find x where n^{th} digit of x is $\neq$ the n^{th} digit of $f(n)$

2nd digit $\neq$ a 2nd off

$x \neq f(n) \Rightarrow$ undecidable

III - Prove that the set of all +ve # divisible by 5 is countable.

$\exists - f(n) = 5n$

n	$f(n)$
0	0
1	5
2	10
3	15
4	20

$\Rightarrow$ countable.

IV - Turing Machines :

a) $(10)^+ 0^+$

1. Start at most left

2. Read if not 1, reject

3. Read if not 0, reject

4. " " " 1, reject

5. " " ~~1~~, go to (3)

doe if ~~a~~ reject

else ~~find~~ find next 1, if exists reject

else accept

Read = move right

b) $(01)^+ 001^+$

1. Start at most left

2. Read if not 0, reject

3. Read if not 1, reject

4. Read if not 0, reject

5. Read if 1, go to (3)

~~6.~~ Else if not 0, reject

7. Read if not 1, reject

8. ~~Read~~ Find next 0, if exist reject

9. Else accept.