HW 8

2) TM can read symbols on a tape, this example can be proven with a binary tape each symbol a_i can be replaced with a binary string b_i of length $\log_2 k$ k is the size of the alphabet.

Example: $\Sigma = \{a, b, c, d\}$ this can encode as

$a = 00$
$b = 01$
$c = 10$
$d = 11$

For each symbol encoded with 2 bits the tape doubles for 3 tripples and soon

in the binary string tape every symbol needs to be decoded have the correct transition applied

then encoded again.

Original TM:

$\Sigma = \{a, b\}$

transition

$q_0, a \to q_1, b, R$

$q_0, b \to q_0, a, L$

Encoded TM

$\Sigma =$ $a = 0$
$b = 1$

$q_0, 0 \to q_1, 1, R$

$q_0, 1 \to q_0, 0, L$

3)

Claim A is decidable

Proof:

If can DFA N there is another DFA N' that can be constructed where given $L(N)$ we can derive $\overline{L(N)}$

This can be done with complementation rules

We can also construct $L(M) \cap L(\overline{N})$ using product construction.

We have to check if $L(M) \cap L(\overline{N})$ is empty

if empty

then accept

else

rejects

Therefore it halts and provides an answer

thus A is decideable