

Student ID :
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Automata Theory Course Quiz-3b (2016-2017Fall)
(Please use free space for draft and fit your answer to boxes.)

1. (50P) For language L used $\Sigma=\{a, b\}$ alphabet, assume words in the tape are separated with one blank symbol. Without adding any symbol to Γ alphabet, prepare a Turing function that writes the second tape 'b' letters as much as number of words in the first tape.

$q_0 a\# \rightarrow q_1 ab RR$

$q_0 b\# \rightarrow q_1 bb RR$

$q_0 \#\# \rightarrow q_{\text{accept}}$

$q_1 a\# \rightarrow q_1 a\# RN$

$q_1 b\# \rightarrow q_1 b\# RN$

$q_1 \#\# \rightarrow q_2 \#b RR$

$q_2 a\# \rightarrow q_1 a\# RN$

$q_2 b\# \rightarrow q_1 b\# RN$

$q_2 \#\# \rightarrow q_{\text{accept}}$

2. (50P) Let be a device to determine the number of "water molecule" in a puddle of water. By the code embedded to the device, write your comments about decidability of determination of the number of "water molecule" in a ocean.

- Because we assume that there is an enumerator for "water molecule"s, we must accept that amount of water molecules in the world can be represented by natural numbers.

- By using only enumerator, we can comment about enumerability but not decidability.

- We know that there are only countable amount of molecules (doesn't matter what they are) in the world, but we don't know our device can detect any molecule as that it is not water molecule.

- So we cannot be sure about decidability.