

Multi-tape Turing Machine

Transition for multi-tape Turing machine

$$\delta: Q \times \Gamma^k \to Q \times \Gamma^k \times \{L, R\}^k$$

$$\delta(q_i, a_1, ..., a_k) = (q_i, b_1, ..., b_k, L, R, ..., L)$$

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## Simulation

• Initially,  $\# w_1 w_2 ... w_n \# \cup \# \cup \# ... \#$ 

 For one move simulation, scan the first #, then the second #, etc.

• It one tape goes out of its #, move the rest of tape in order to get one space for it. (stupid, slow)

Another simulation

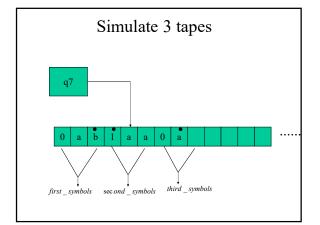
orange for tape one for

Assume there are k tapes

Let the positions i, k+i, 2k+i, ...., mk+i,... be used for simulating the tape i.

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## Problem

Design a Turing machine to accept the language

$$\{a^nb^nc^n\mid n\geq 0\}$$

1. Briefly describe your design.

2. Show the number of steps to recognize a string of length m.

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