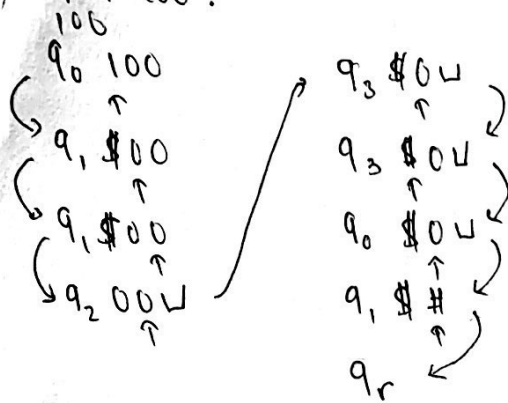


LE THANH OVC - Y249Y8.

1. a) input 100:



b) So based on the Turing Machine transition diagram, the machine takes number which contains 1 and 0 and replace 1 with \$ and 0's with #.

$$\Rightarrow L(M) = \{w = t_1 t_2 \mid t_1, t_2 \in \{1, 0^*\}, u_1, u_2 \in \{\$, \#\} : t_1 t_2 = u_1 u_2, |t_1| = |u_1|, |t_2| = |u_2|\}$$

c) Complexity: $\Theta(n^2)$

4. Set of domino has solution $\{a, b\}$

$D = \frac{abbab}{abbab} \quad \frac{babba}{babbab} \quad \frac{abbabbabbaa}{abbabbabbab} \quad \cdot \quad D \text{ has a solution } d.$

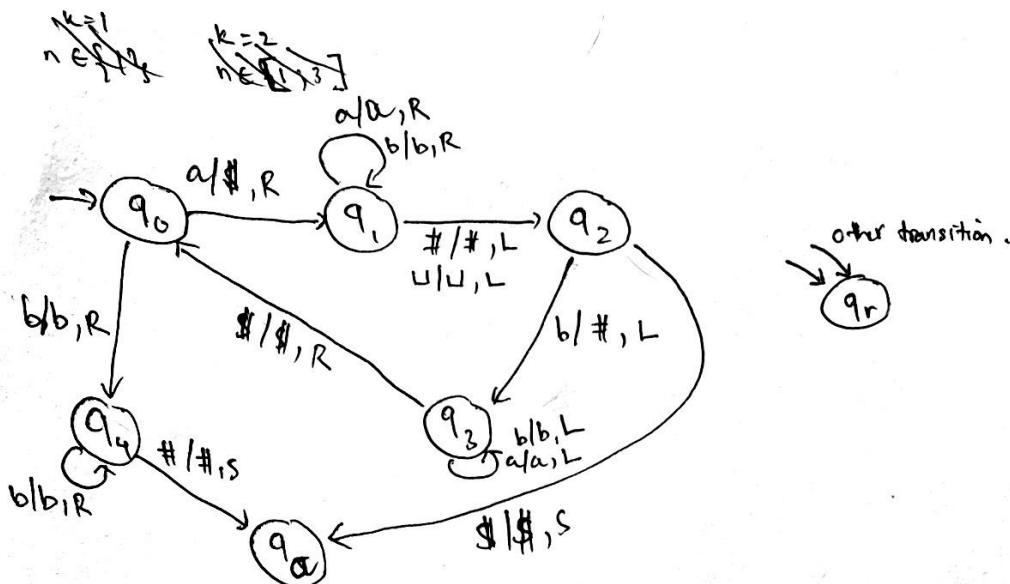
$d \quad d' \quad d''$

$D' = \frac{abbab}{babba} \quad \frac{babba}{babbab} \quad \frac{abbabbabbaa}{abbabbabbab} \quad \cdot \quad D' \text{ has no solution because we cannot find matching top and bottom of either } d_1, d_2 \text{ or } d_3$

$d_1 \quad d_2 \quad d_3$

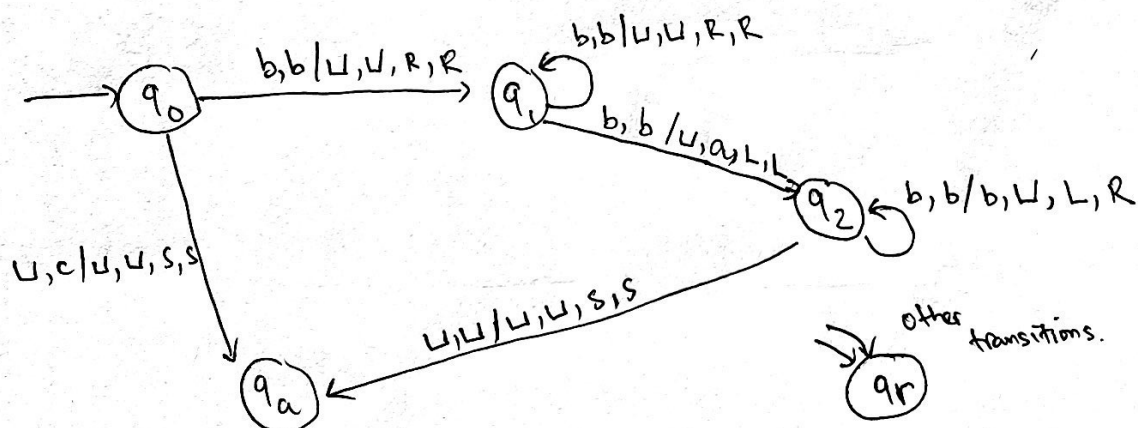
So none of dominoes can be start of solution.

3 a) $L = \{ a^k b^n \mid 1 \leq n \leq 2k-1 \}$



b) $\Theta(n^2)$

2 a) $f(b^n) = \begin{cases} b^n - 4b^{n-1} & \text{if } n > 0. \\ c & \text{if } n = 0. \end{cases}$



So Turing Machine I made was to copying the input to another tape (= output) then replace last character of output by 'a' and delete also 1 'b' from input. In the end, copy again the input to append the output.

b) $\Theta(n^2)$