

INT201 Decision, Computation and Language

Tutorial 7

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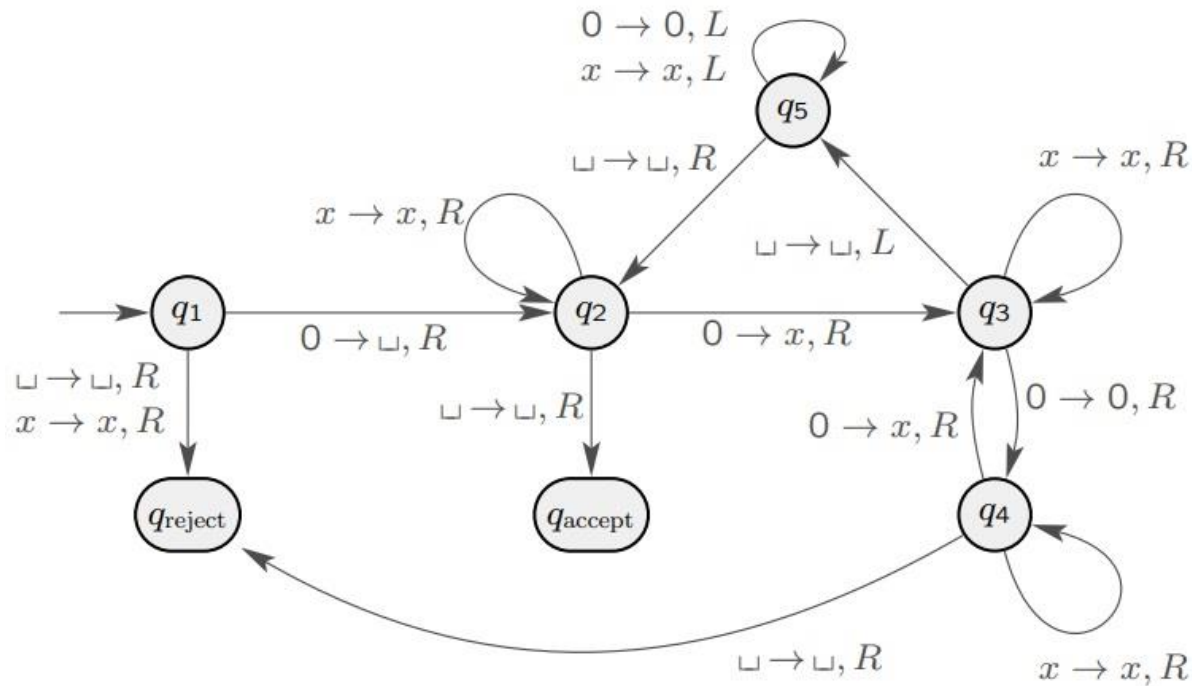
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1. Given a TM M for language

$$A = \{0^{2^n} \mid n \geq 0\}$$

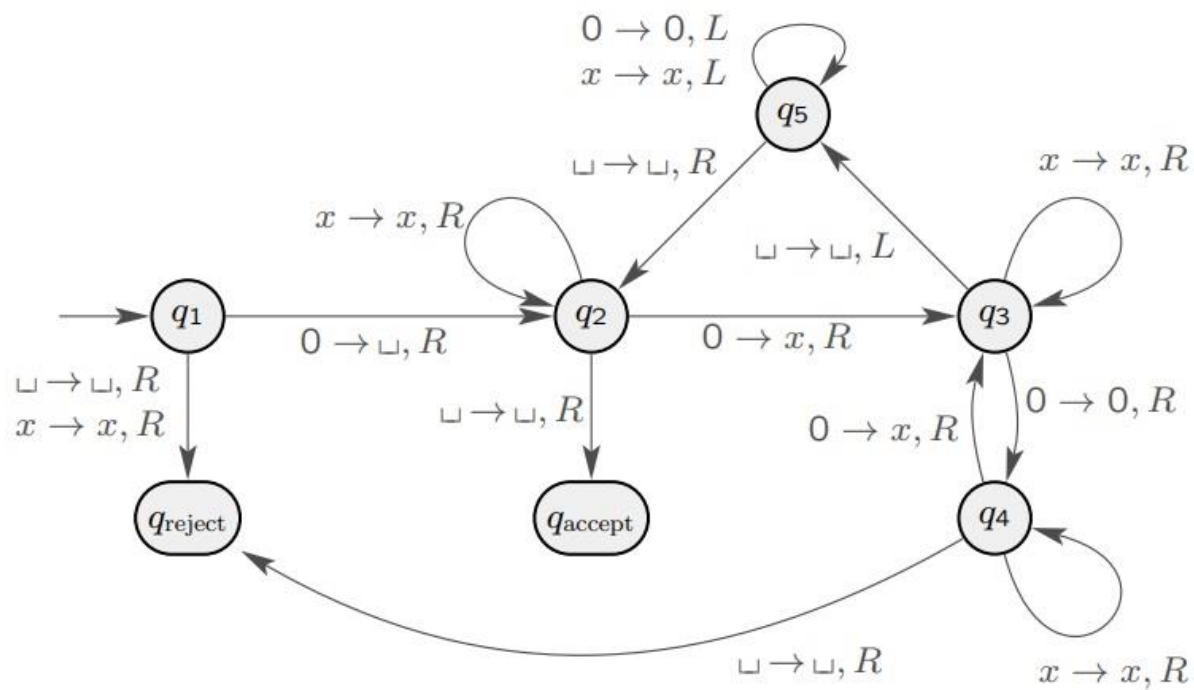
which consists of strings of 0s whose length is a power of 2.



Present the detailed process when running M with input $w = 0000$.



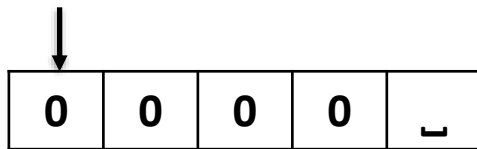
2. With the same TM M and input string $w = 0000$ as Question 1, describe the detailed process using configurations.



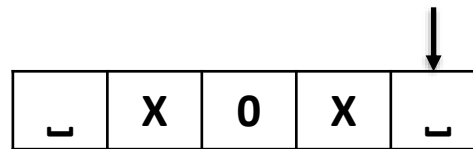
Solution

1.

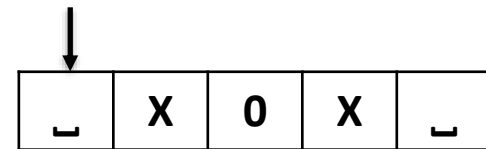
Step 0, state q_1



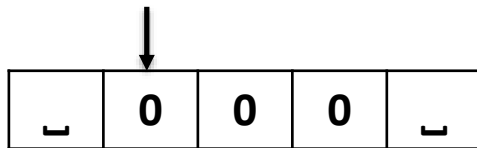
Step 4, state q_3



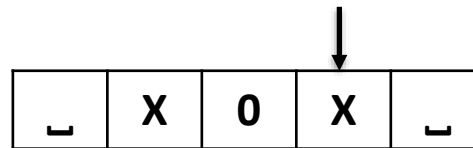
Step 8, state q_5



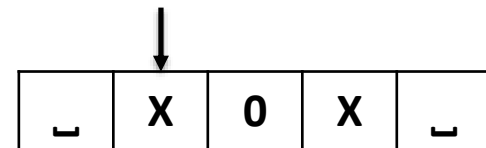
Step 1, state q_2



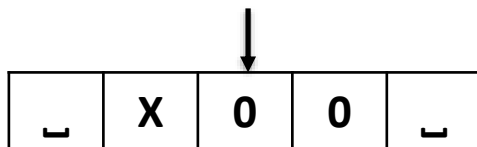
Step 5, state q_5



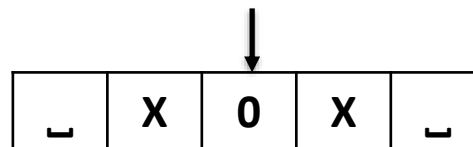
Step 9, state q_2



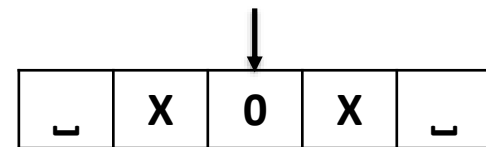
Step 2, state q_3



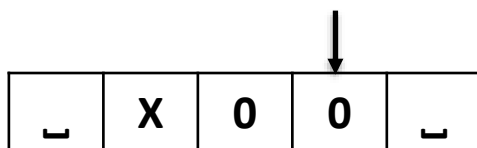
Step 6, state q_5



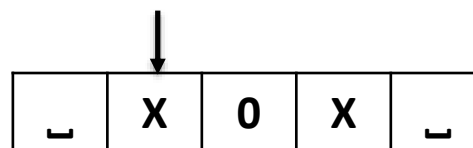
Step 10, state q_2



Step 3, state q_4

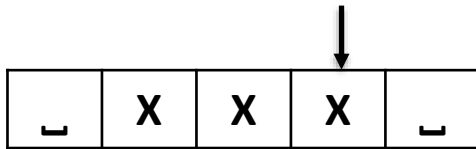


Step 7, state q_5

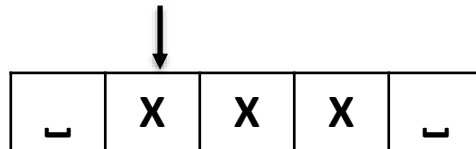


Solution

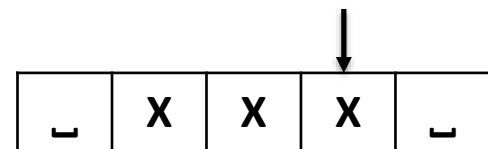
Step 11, state q_3



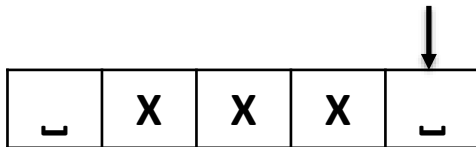
Step 15, state q_5



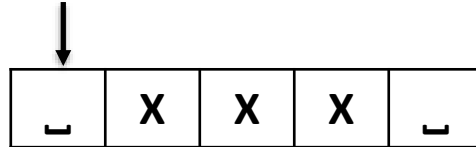
Step 19, state q_2



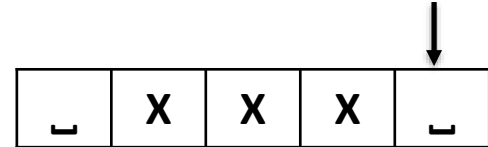
Step 12, state q_3



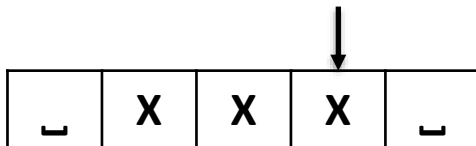
Step 16, state q_5



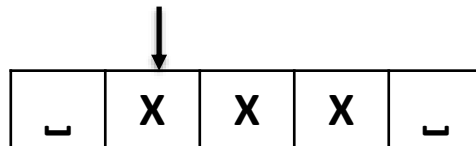
Step 20, state q_2



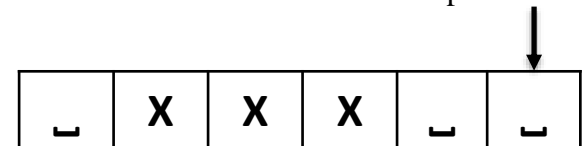
Step 13, state q_5



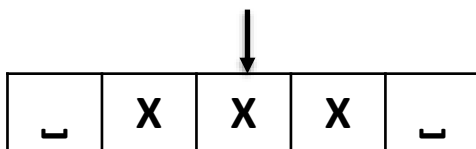
Step 17, state q_2



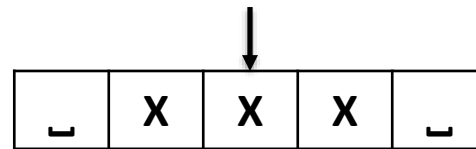
Step 21, state q_{accept}



Step 14, state q_5



Step 18, state q_2

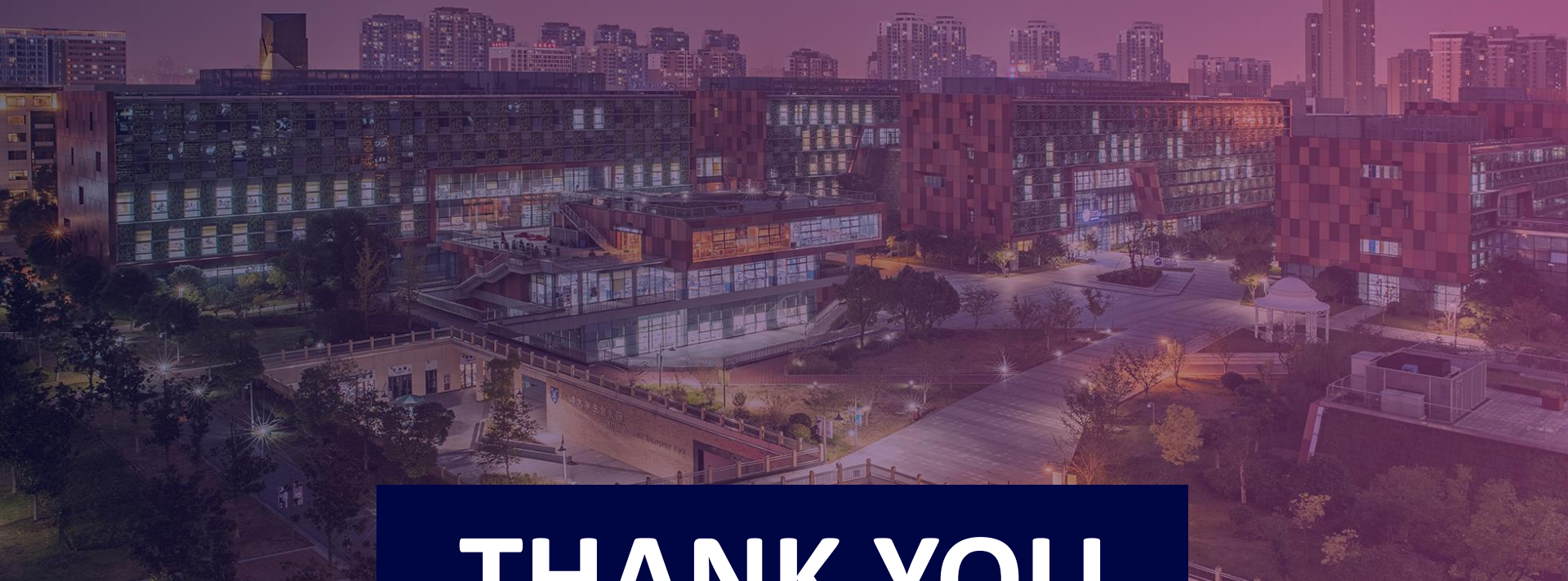


Solution

2.

$q_1 0000, \sqcup q_2 000, \sqcup x q_3 00, \sqcup x 0 q_4 0, \sqcup x 0 x q_3 \sqcup, \sqcup x 0 q_5 x,$
 $\sqcup x q_5 0 x, \sqcup q_5 x 0 x, q_5 \sqcup x 0 x, \sqcup q_2 x 0 x, \sqcup x q_2 0 x, \sqcup x x q_3 x,$
 $\sqcup x x x q_3 \sqcup, \sqcup x x q_5 x, \sqcup x q_5 x x, \sqcup q_5 x x x, q_5 \sqcup x x x, \sqcup q_2 x x x,$
 $\sqcup x q_2 x x, \sqcup x x q_2 x, \sqcup x x x q_2 \sqcup, \sqcup x x x \sqcup q_{\text{accept}} \sqcup .$





THANK YOU



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