


Rosen, Discrete Mathematics and Its Applications, 6th edition
 Extra Examples

Section 12.5—Turing Machines

 — Page references correspond to locations of Extra Examples icons in the textbook.

p.829, icon at Example 1

#1. Let T be the Turing machine defined by these five-tuples:

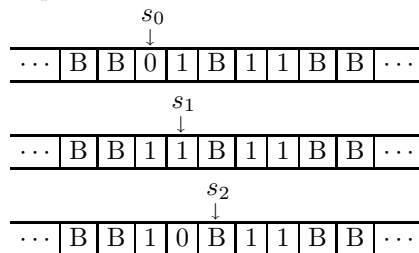
$$(s_0, 0, s_1, 1, R), (s_0, 1, s_0, 0, R), (s_0, B, s_1, 0, R), (s_1, 0, s_0, 0, R), (s_1, 1, s_2, 0, R), (s_1, B, s_2, 1, L).$$

If T is run on the following tape, beginning in initial position, what is the final tape when T halts?

$$\cdots \boxed{B} \boxed{B} \boxed{0} \boxed{1} \boxed{B} \boxed{1} \boxed{1} \boxed{B} \boxed{B} \cdots$$

Solution:

Beginning with the above tape, we obtain the following sequence of tapes, ending with the last tape in the sequence:



Machine halts.

p.829, icon at Example 1

#2. Let T be the Turing machine defined by these five-tuples:

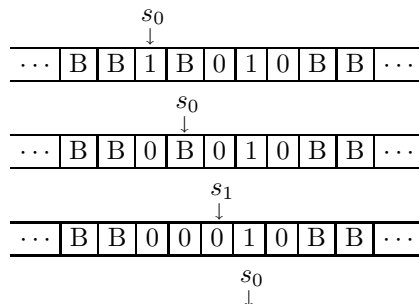
$$(s_0, 0, s_1, 1, R), (s_0, 1, s_0, 0, R), (s_0, B, s_1, 0, R), (s_1, 0, s_0, 0, R), (s_1, 1, s_2, 0, R), (s_1, B, s_2, 1, L).$$

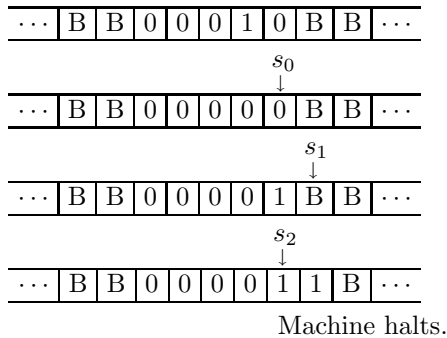
If T is run on the following tape, beginning in initial position, what is the final tape when T halts?

$$\cdots \boxed{B} \boxed{B} \boxed{1} \boxed{B} \boxed{0} \boxed{1} \boxed{0} \boxed{B} \boxed{B} \cdots$$

Solution:

Beginning with the above tape, we obtain the following sequence of tapes, ending with the last tape in the sequence:



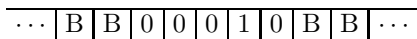


p.829, icon at Example 1

#3. Let T be the Turing machine defined by these five-tuples:

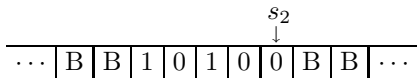
$$(s_0, 0, s_1, 1, R), (s_0, 1, s_0, 0, R), (s_0, B, s_1, 0, R), (s_1, 0, s_0, 0, R), (s_1, 1, s_2, 0, R), (s_1, B, s_2, 1, L).$$

If T is run on the following tape, beginning in initial position, what is the final tape when T halts?



Solution:

Beginning with the above tape, we end with the following tape:



p.829, icon at Example 1

#4. Let T be the Turing machine defined by these five-tuples:

$$(s_0, 0, s_1, 1, R), (s_0, 1, s_0, 0, R), (s_0, B, s_1, 0, R), (s_1, 0, s_0, 0, R), (s_1, 1, s_2, 0, R), (s_1, B, s_2, 1, L).$$

If T is run on the following tape, beginning with the third blank from the left, what is the final tape when T halts?



Solution:

Beginning with the above tape, we end with the following tape:

