

**Problem 6.18.** Show that  $\overline{EQ_{TM}}$  is recognizable by a Turing machine with an oracle for  $A_{TM}$ .

*Solution.* Construct **TM**  $S^{A_{TM}}$  as follows.

$S^{A_{TM}}$  = “On input  $\langle M, N \rangle$ , where  $M$  and  $N$  are **TMs**:

1. Run enumerator for  $M$ .
2. Repeat for each string  $s_i$  generated by  $M$ ’s enumerator.
3.     Query the oracle to determine whether  $\langle N, s_i \rangle \in A_{TM}$ .
4.     *Accept*, if oracle rejects.”

□