Solution to Problem 20

**Problem.** Suppose that $A$, $B$ are r.e. sets. If a number $n$ appears in the $A$-generating algorithm at moment 3, and the complement $-A$ is also r.e., when will the deciding algorithm tell us that $n$ is an element of the set $A$?

**Solution.** According to the lecture, we do the following:

1. First, we run the $A$-generating algorithm for 1 moment of time. This takes the 1st moment of time of the $A$-deciding algorithm.
2. Then, we run the $(-A)$-generating algorithm for 1 moment of time. This takes the 2nd moment of time of the $A$-deciding algorithm.
3. Then, we run the $A$-generating algorithm for 1 more moment of time. This takes the 3rd moment of time of the $A$-deciding algorithm.
4. Then, we run the $(-A)$-generating algorithm for 1 more moment of time. This takes the 4th moment of time of the $A$-deciding algorithm.
5. After that, we run the $A$-generating algorithm for 1 more moment of time – 5th moment of time of the original $A$-generating algorithm. During this moment of time, the $A$-generating algorithm produces the desired number $n$ (and maybe some other numbers). This computation takes the 5th moment of time of the $A$-deciding algorithm.

So, the $A$-deciding algorithm will conclude that $n$ is in the set $A$ at moment 5.