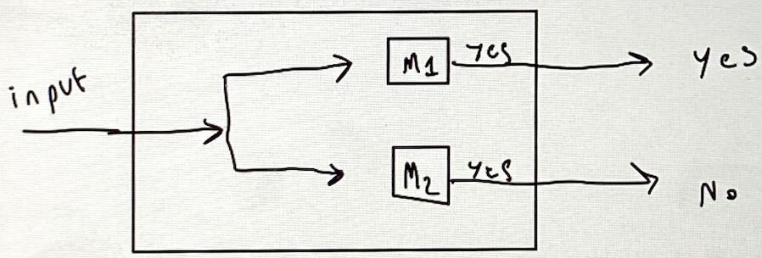
Cpts 317 - Homework #11

1.

a. Show that if both L and (the complement) $\bar{L}$ are r.e., then L is recursive.

- If L and $\bar{L}$ are recursively enumerable, then their Machine can be put together form 1 Machine that both accepts and rejects.



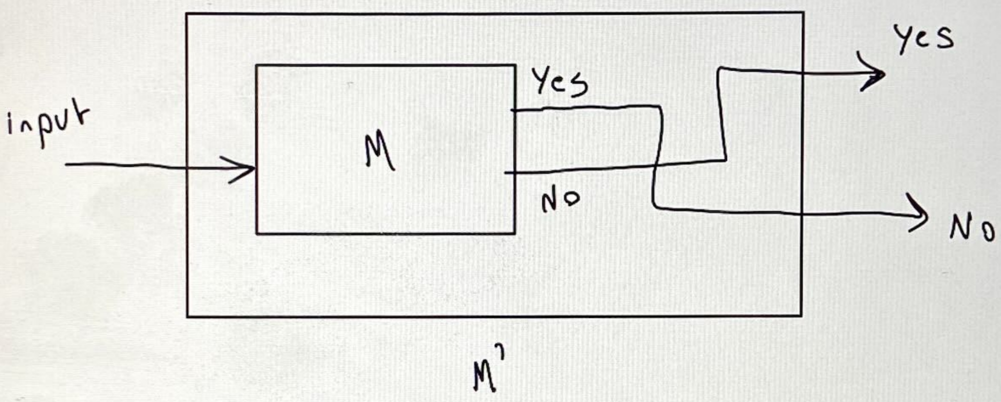
This would Mean L is recursive.

b. Show that r.e. languages are not closed under complement.

- explanation:

If recursively enumuable (R.e.) langrages were Closed under complemet then both L and $\bar{L}$ would be R.e. and hence recursive, which would Mean that all R.e. languages recursive Which we Know is not true.

2. Show that recursive languages are closed under complement.



• if M is recursive, then so its complement (interchange states), Assume both M and M' are r.e.; that is, they have TMs then run the two TM's in parallel. At least one will halt, and that gives the answer.

3. What does this excersize say about the program?

- This exercise suggests that there are infinitely many different turing Machines that accept the Same language. In other words, there are infinitely Many different programs that can be written to achieve the Same task. This means that there are multiple ways to Solve a problem, and the Same Solution can be reached in different ways. This would Mean there is no one Single "best" way to Solve a problem, as different programs can reach the Same result.

- The strings in a given dictionary, the turing machine has to be lower compatible, so the langrage determined by m_i can be accepted by m also. If the langrage accepted by two turning machines are Same, it can be Said that $L(M) = L(m_i)$. Since the turing Machine accepts two strings from a dictionary this means the Turing Machines are the Same.

4.

Given a TM M, whether M contains the same number of L-instructions and R-instructions?

Note: *

Must check all the transition functions of M, if the number of transition functions moving toward L is the same as the number of transitions moving towards Right then TM will be in the language, by looking at this problem we can verify that this problem is decidable.

5. Show that the following problem is also decidable:

Given a TM M, whether there exists a TM M' such that M' contains the same number of L-instructions and R-instructors, and $L(M') = L(M)$?

L-instructions and R-instructions

M = on input $\langle M, M' \rangle$

1. Repeat the following for $i = 1, 2, 3$

2. Simulate M for i steps, record any output L-instruction on the tape

3. Simulate M' for i steps. store any output that of M' on the tape

4. Compare the output of M and M'; if the output are the same then it is decidable and $L(M) = L(M')$