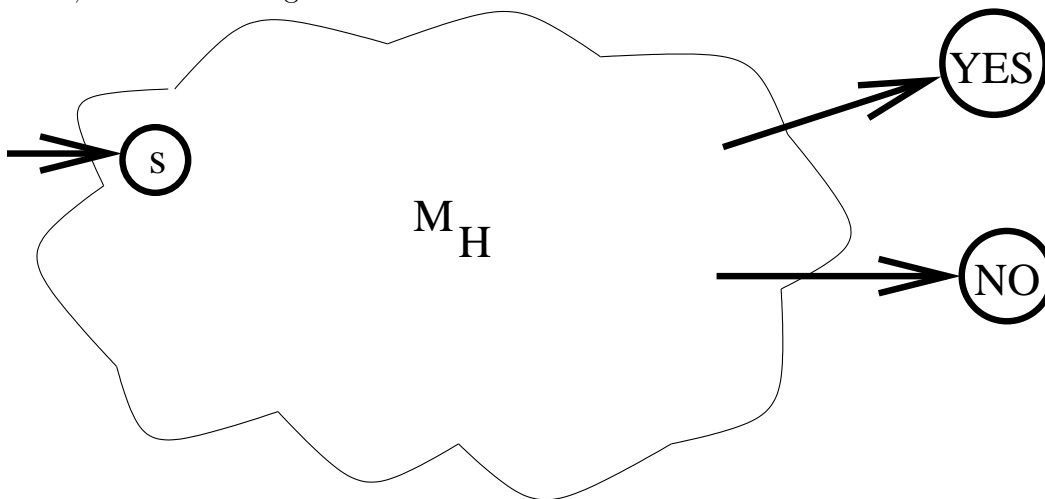


COMP 610 Homework 2

Due 20:00 Friday March 9

1. Construct a Turing Machine M that decides $L = \{a^i b^j c^k d^\ell : i + k = j + \ell\}$ (ie M stops in state “YES” if the input is in L and “NO” if it isn’t). Explain how your Turing Machine works.
2. Construct a k -string Turing Machine M which starts with a number in unary on the first tape and ends with the same number in binary on the last tape. In other words, if M is started with a string of n 1’s on the first tape then M should halt with the number n in binary on the last tape. Explain how your Turing Machine works.
3. In the proof that HALTING is undecidable, the (assumed to exist) Turing Machine M_H is modified to a new Turing Machine D . Assume that M_H is represented by the image below, draw the Turing Machine D .



4. Let $REG = \{M : L(M) \text{ is a regular language}\}$. Prove that REG is not recursive by reducing H to REG . For those preferring the “question” version: Given a Turing Machine M , does M accept a regular language?