

## Problem Set 2 – Dew Thu, 11 Apr 2024

Definition: **dew**: *adjective*. 1. An assignment is *dew* on a certain date if it can be turned on that date, cannot be turned in at a later date, but and need not be turned in at all.

**Problem 5.** Alice shuffles a deck of 52 cards and deals it out to herself and Bob so that each gets half of the cards. Alice now wants to send a secret message  $M$  to Bob. Eavesdropper Eve is watching and sees the transmissions.

*Part A.* Suppose Alice's message  $M \in \{0,1\}^{48}$  is a string of 48 bits. Describe how Alice can communicate  $M$  to Bob in a way that achieves perfect privacy.

*Part B.* Now suppose Alice's message  $M \in \{0,1\}^{49}$  is 49 bits. Prove that there does not exist a protocol that allows Alice to communicate  $M$  to Bob in a way that achieves perfect privacy.