Submissions: This assignment is due on Tue Apr 7th. Each student must submit his or her own assignment. You must write your name and UUID clearly on your submitted assignment. Submit, by first arranging in order the problems, scanning or taking a clear photo, and uploading the files to the designated submission folder on elearn.

Academic Integrity: You are encouraged to work in groups, but everyone must write out their own solutions. Absolutely no word to word copying is allowed. Please refer to the course policies and schedules about this. If you have worked with other students on the assignment or referred to external sources, please mention all names and sources on your assignment.

Partial solutions: If you are sure that you know how to arrive at a solution, but you get stuck in some place, it is better to write the partial solution. Honest attempts at partial solutions will be awarded.
**Problem 1** [15 + 15 = 30 pts]: Show that the following are tautologies by going through a series of equivalent propositions until you reach $T$.

(a) $[(p \to q) \land (q \to r)] \to (p \to r)$
(b) $[(p \lor q) \land (p \to r) \land (q \to r)] \to r$

**Problem 2** [10 pts]: How many binary strings of length 15 contain the same bit in all the odd numbered positions? The positions are numbered 1, 2, …, 15. Show how you arrived at your answer, which rules of counting were used etc.

**Problem 3** [10 pts]: Describe in words what the following proposition says: $\forall x \in \mathbb{R} \forall y \in \mathbb{R} ((x \neq 0) \to (\exists z \in \mathbb{R} \; y = xz))$. Is it true?

**Problem 4** [20 pts]: How many different committees of 6 people can you form from a group of 10 men and 8 women so that it includes 4 women and 2 men? The positions of the committee are not numbered in any way. Show how you arrive at your answer.

**Problem 5** [10 pts]: Find the number of distinct words (meaningful or not) you can form by rearranging (in all possible ways) the letters in “ABRACADABRA”.

**Problem 6** [20 pts]: Find the number of functions $f : \{1, 2, 3, 4, 5, 6\} \to \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ that satisfy the condition, $f(1) = f(6)$ and $f(3) = f(5)$. 