Assignment 1

Due date: July 10, 2017

Please submit your assignment electronically via Moodle, using a word or pdf file. Clearly define all non-standard symbols used.

1. Given that R = {2,4,6,8} and S = {1,3,5,7}, such that an element x in R is related to an element y in S if (y-x) > 1
    a. What are the related elements in R and S? Show them as ordered pairs and state how you arrive at each ordered pair (3 marks)
    b. Show the relations using a properly labeled arrow diagram (2 marks)
2. Using a truth table, show whether (~ b ∧ (a→ b)) → ~a is a tautology or not, and state why the use of truth table allows you to say that the expression is a tautology or not (5 marks)
3. Prove the validity of the following argument using a truth table (5 marks)

    Premises: p∨q, p→r, q→r

    conclusion: r
4. Using the digital circuit in the attached document (See assignment 1 diagram).
    a. Find the Boolean expression for the circuit. (2 marks)
    b. Using the appropriate logical equivalence laws, show that the Boolean expression in (a) is equivalent to t. Reference the logical equivalence law(s) that you used at every stage of your proof. (3 marks)