**SOEN 228 Practice Problem Set #1**

These problems focus on relating Boolean expressions to their truth table and logic gate equivalents.

In general you should be able to use all three of these representation to analyze and compare digital systems.

**Question 1)** Given a system described by the Boolean expression: $F = A \cdot B + \overline{(C \cdot D)} + A \cdot B \cdot (\overline{D})$ fill out the truth table for the system.

**Question 2)** From the truth table given below, where A, B and C are inputs and F is the output:

| A | B | C | F |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

    i)       Construct the logic circuit using 4-input AND gates, 4-Input OR gates and NOT gates.
    ii)     Construct the logic circuit using 2-input AND gates, 2-input OR gates and NOT gates

**Question 3)**

Given a two-input exclusive OR (XOR) circuit with inputs A and B and output F. This circuit output will be true if and only if a single input is true. If both are true or both are false the output will be false.

    i)       Construct the circuit using only AND, OR and NOT gates
    ii)     Construct the circuit using only NAND gates. (NAND gate is AND with series NOT gate)
    iii)    Construct the circuit using only NOR gates. (NOR gate is OR gate with series NOT gate)