COE 405, Term 152

Design & Modeling of Digital Systems

HW# 1

Due date: Thursday, Feb. 11

Q.1. Consider the two functions $f = a \oplus b \oplus c$ and $g = a\,b + a\,c + b\,c$.

    (i) Implement the function g using only 2x1 MUXs.

    (ii) Compute the function $f \oplus g$ based on orthonormal basis expansion.

Q.2. It is required to design a combinational circuit that computes the equation $Y = 3*X - 1$, where X is an n-bit signed 2's complement number.

    (i) Design the circuit as a modular circuit where each module receives a single bit of the input, X_i.

    (ii) Derive the truth table of your 1-bit module in (i).

    (iii) Derive minimized two-level sum-of-product equations for your 1-bit module circuit.

    (iv) Verify the correctness of your design by modeling and simulating a circuit to compute the required equation assuming X is a 4-bit number using logicworks.

*This assignment can be solved based on a group of two students. The solution should be well organized. Submit a soft copy of your solution in a zip file including your logicworks files. Your solution should be submitted in a **word file** that contains the following items:*

    i. *Your name and ID*

    ii. *Assignment number*

    iii. *Problem statement*

    iv. *Your solution*

    v. *Include snapshots of simulation output to illustrate the correctness of your solution.*