COE 405, Term 131

Design & Modeling of Digital Systems

HW# 1

Due date: Sunday, Sep. 29

Q.1. Consider the two functions f=a b c + a' b' c' and g=a b+a' c.

(i) Implement the function f using a single 4x1 MUX.

(ii) Compute the complement of f.

(iii) Compute the function f⊕g based on orthonormal basis expansion.

Q.2. It is required to design a combinational circuit that computes the equation Y=5*X, where X is an n-bit unsigned 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 4-bit circuit using logicworks.

(v) Assume that the delay of a gate is related to the number of its inputs, i.e. the delay of an inverter is 1, the delay of a 2-input gate is 2, etc. Compute the maximum propagation delay of your n-bit circuit.

(vi) Verify the correctness of your maximum propagation delay calculation by measuring the longest delay for a 4-bit circuit using logicworks.