

Name:

Id#

COE 202, Term 052
Fundamentals of Computer Engineering

Quiz# 4 (Take Home)

Due date: Monday, April 10, 2006

Q.1. You are required to design a circuit that computes the remainder of dividing a 4-bit number by 3. For example, if the input is 1010 the circuit produces a remainder output of 01 and if the input is 1111 the circuit produces an output of 00.

- a. Derive the truth table of your circuit.
- b. Using k-map simplification, find the minimum sum-of-products expressions for each of the output signals.
- c. Perform multilevel optimizations if possible.
- d. Model your circuit using logic works and verify that it is working properly by simulation. Provide a snapshot of your simulation waveform.

Q.2. (1% Bonus Question)

You are required to design a circuit that computes the remainder of dividing a N-bit number by 3., where N is a multiple of 4-bit numbers. The design needs to be modular in such a way that you design a cell that computes the remainder of dividing a 4-bit number by 3, and use this cell to construct the required circuit.

- a. Derive the truth table of your basic cell.
- b. Using k-map simplification, find the minimum sum-of-products expressions for each of the output signals.
- c. Perform multilevel optimizations if possible.
- d. Model your cell using logic works and verify that it is working properly by simulation. Provide a snapshot of your simulation waveform.
- e. Using your design cell, construct a circuit that computes the remainder of dividing an 8-bit number by 3. Verify the correct functionality of your circuit by simulation.

