Digital Design Preliminary Exam

(Spring 2015)

Problem 1	20 points
Problem 2	20 points
Problem 3	15 points
Problem 4	15 points
Problem 5	15 points
Problem 6	15 points
Total	100 points

Name and Student ID: _____

Name (Print Please) Student ID

Date: 3/27/2015

Problem 1

For the circuit of a 4-bit binary counter below, give two alternatives for a mod-6 counter
(1) Using load input.
(2) Using the asynchronous clear input.
Draw the circuit for each design with all the necessary connections marked clearly based on Fig. 1 (a). The 4-bit "Data_in" and "A_count" can be split to each bit if necessary to show different connection. Fig. 1 (b) is provided for you to better understand the counter, you don't have to draw the inside circuit of the counter.

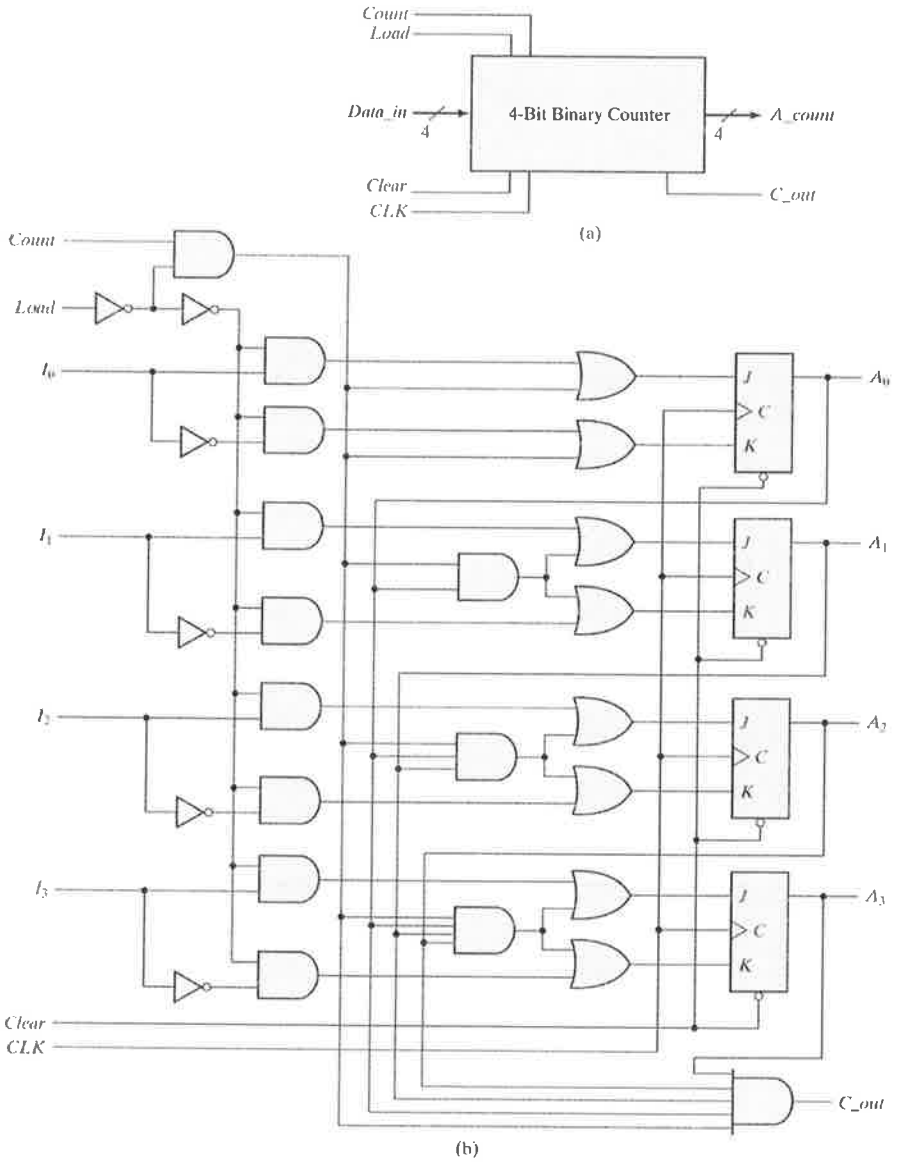

Fig. 1 4-bit binary counter with parallel load

Problem 2

Draw a PLA circuit to implement the functions below. Illustrate the PLA Programming Table and any Boolean Function simplification.

$M_1 = AB + AC' + A'B'C$

$M_2 = (A'B + A'C + BC)'$

Problem 3

Design a Full Adder using only **one type of logic gate**. Show the Truth Table and Logic Circuit.

Problem 4

Using Block Diagrams, illustrate the fundamental differences between the RAM and ROM memory modules. Please label all inputs and outputs.

Problem 5

Use a 4-to-1 multiplexer to design a majority function (three inputs, one output goes with majority value of the inputs). Show truth table and circuit.

F (A, B, C)

Problem 6

Design a counter that counts pulses on line w and displays the count in the sequence 0, 2, 1, 3, 0, 2, 1, 3, ... Use D flip-flops and other necessary logic gates in your circuit. Illustrate the State Table and the Counter Circuit.