Name _____

First Last

Student ID # _____

University of California

Los Angeles

Computer Science Department

CSM51A/EEM16 Midterm Exam #2

Winter Quarter 2015

February 23rd 2015

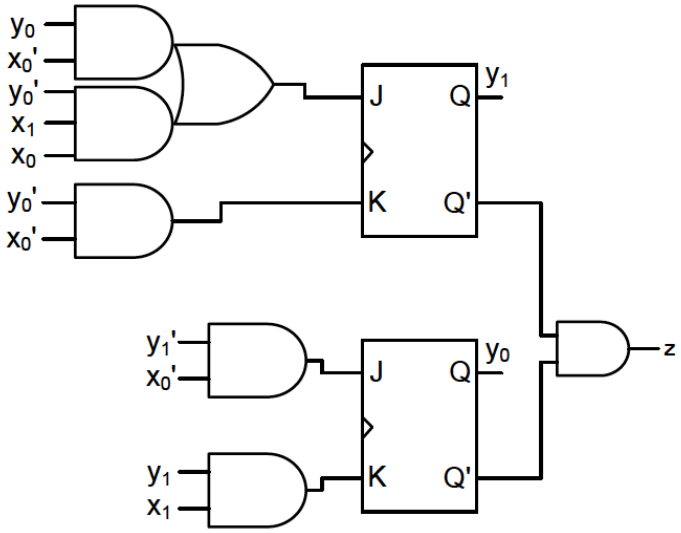
This is a closed book exam. Absolutely nothing is permitted except pen, pencil and eraser to write your solutions. Any academic dishonesty will be prosecuted to the full extent permissible by university regulations.

Time allowed 100 minutes.

Problem (possible points)	Points
1 (20)	
2 (20)	
3 (20)	
4 (20)	
5 (20)	
Total (100)	

Problem 1 (20 points)

Obtain a high-level description (state transition table) of the network shown in the figure below. The system has two input bits x1 and x0, with a single output bit z.



Problem 1) Extra Page

Problem 2 (20 points)

Add 3 states and their transitions to the following table, so that the table will have 5 states after minimization.

	INPUT	
PS	x=0	x=1
A	B,0	C,0
B	B,0	D,0
C	B,0	A,0
D	C,0	E,1
E	E,1	F,1
F	F,1	E,1

Problem 2) Extra Page

Problem 3 (20 points)

Using RD flip-flops as defined below, design a system as described below. Use only multiplexers to implement your combinational logic.

Input set: {a, b, c}

Output: 1, if $x(t-n, t) = a[b|c]^{*}d^{+}a$

0, otherwise

Note: * denotes a character can appear 0 to infinite number of times.

+ denotes a character can appear 1 to infinite number of times.

b|c denotes b or c.

For example, given abcbdda, the output should be 1.

	RD			
PS,Q(t)	00	01	10	11
0	1	0	0	1
1	1	0	1	0
	NS, Q(t+1)			

Problem 3) Extra Page

Problem 4 (20 points)

Given an input stream of 0s and 1s, design a system that outputs the length, **Z**, of the largest palindrome found in the last 7 inputs, along with the parity, **P**, of the length of that palindrome. A palindrome is a string that is spelled the same forwards as it is backwards. For example, the following strings are palindromes: 10101, 11, 1001, 0000. **P** is equal to 1 when the length of the palindrome is odd, and 0 when its length is even. Your system should only consider palindromes of length 2 to 7.

For example, given the following input stream, 1010101, the output should be Z=7 and P=1. For the input stream, 1010000, the output should be Z=4 and P=0.

Use any flip-flops and combinational gates of your choosing to implement this system.

Problem 4) Extra Page

Problem 5 (20 points)

Using 1 JK flip-flop, 1 SR flip-flop, and at most 8 D flip-flops, design a system as described below. Use any gates to implement your combinational logic.

Input set: {0,1}

Output: 1, if x(t-11, t-8)=1001, x(t-7, t-4)=01-1 or -0-0, x(t-3, t)=0-11

0, otherwise

For example, for the given input stream x(t-11, t)=100101010011, output=1. For the input stream x(t-11, t)=100110100101, output=0.

Problem 5) Extra Page