

Name: KEY

Id#

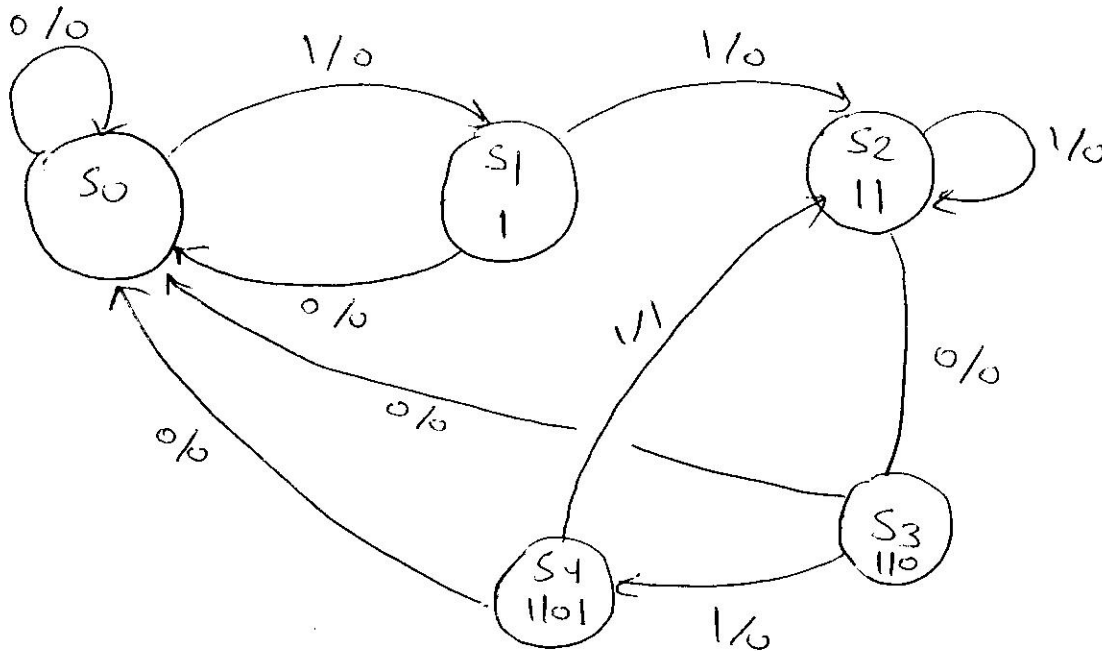
COE 202, Term 102
Fundamentals of Computer Engineering

Quiz# 8

Date: Saturday, May 21, 2011

Q.1. It is required to design a sequential circuit that receives a serial input X and produces a serial output Z. The output Z will be 1 when the circuit detects the sequence 11011 assuming overlapping sequence detection. Derive the state diagram for your circuit, and then obtain the circuit implementation optimizing the output and next state equations assuming D-FFs. Use binary code for state encodings. Assume the existence of a reset input to reset the machine to a reset state.

State Diagram:



State Table:

Current State	X	Next State	Z
S0	0	S0	0
S0	1	S1	0
S1	0	S0	0
S1	1	S2	0
S2	0	S3	0
S2	1	S2	0
S3	0	S0	0
S3	1	S4	0
S4	0	S0	0
S4	1	S2	1

We assign the binary codes to the states and the state table becomes as follows:

Current State F2F1F0	X	Next State F2F1F0	Z
000	0	000	0
000	1	001	0
001	0	000	0
001	1	010	0
010	0	011	0
010	1	010	0
011	0	000	0
011	1	100	0
100	0	000	0
100	1	010	1

K-map Simplification:

	$F_0 X$	00	01	11	10
$F_2 F_1$	00	0	0	0	0
	01	0	0	0	0
	11	x	x	x	x
	10	0	1	x	x

$$Z = F_2 X$$

	$F_3 X$	00	01	11	10
$F_2 F_1$	00	0	0	0	0
	01	0	0	1	0
	11	x	x	x	x
	10	0	0	x	x

$$F_2^+ = F_1 F_0 X$$

	$F_0 X$	00	01	11	10
$F_2 F_1$	00	0	0	1	0
	01	1	1	0	0
	11	x	x	x	x
	10	0	1	x	x

$$F_1^+ = F_1 \bar{F}_0 + F_2 X + \bar{F}_1 F_0 X$$

	$F_0 X$	00	01	11	10
$F_2 F_1$	00	0	1	0	0
	01	1	0	0	0
	11	x	x	x	x
	10	0	0	x	x

$$F_0 = F_1 \bar{F}_0 X + \bar{F}_2 \bar{F}_1 \bar{F}_0 X$$

Logic Works Circuit:

