

Quiz 6

60 minutes

1. (35) For the following state table, find the equations for the output and the inputs to D flip flops for each of the following state assignments. DO NOT draw block diagrams! (Note that the three solutions are quite different from each other.) See worksheet on next page.

q	q *		z
	x = 0	x = 1	
A	C	B	0
B	D	A	1
C	A	B	1
D	B	A	0

a)

q	q ₁	q ₂
A	0	0
B	0	1
C	1	0
D	1	1

b)

q	q ₁	q ₂
A	0	0
B	0	1
C	1	1
D	1	0

c)

q	q ₁	q ₂
A	0	0
B	1	1
C	1	0
D	0	1

2. (35) Design a counter that goes through the sequence

0 9 2 11 4 13 6 15 8 1 10 3 12 5 and repeat

Where the four flip flops are labelled A, B, C, D and (and, for example, A=0, B=1, C= 0, D=1 represents 5.) A is a JK flip flop, B is an SR flip flop, C is a D flip flop and D is a T flip flop. Show the input equations and a block diagram. (Some blank maps are given on the next page.)

BONUS (5 points) Show a state diagram, indicating what happens if this starts in one of the unused states (7 or 14). Be sure to indicate which of the multiple solutions you use for R.

3. Show the state table or the state diagram for a Mealy system with one input, x, and one output, z, such that $z = 1$ iff there has been a pattern of 1 0 1 or of 0 1 0 under each of these assumptions:

a) (20) Overlapping is allowed (4 states)

b) (10) Overlapping is not allowed (5 states)

Example

x	0 0 1 0 1 0 1 1 0 1 0 1 1 0 0 1 0
za	? 0 0 1 1 1 1 0 0 1 1 1 0 0 0 0 1
zb	? 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0 1 0 0