

1. (20) Show a state table or a state diagram for a system with one input, x , and one output, z , such that $z = 1$ if and only if the input has followed a pattern of 10101

- a) If overlapping is allowed.
- b) If overlapping is not allowed

(Full credit for a system with 5 states in each.)

Example

x	0	0	1	0	1	0	1	0	1	0	1	0	1	1	0	1	0	1	1			
z (a)	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0	0	0	1	0	0	0	0
z (b)	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0

2. (15) For the following state table, indicate which of the listed partitions are SP and which are output consistent.

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

$P_1 = (A) (B) (C) (D) (E)$

$P_2 = (A) (B E) (C D)$

$P_3 = (A B E) (C) (D)$

$P_4 = (A B E) (C D)$

$P_5 = (A B C D E)$

$P_6 = (A C D E) (B)$

3. (15) For the following state table (no output column shown)

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

- a) Find all of the non-trivial SP partitions.
- b) Find an output column that
 - i. does not allow the system to be reduced to fewer than 4 states
 - ii. allows it to be reduced to 2 or 3 states.
 - iii. that allows it to be reduced to 1 state.