

CSE 142
Exam #1, Summer Session 2003
Instructor: Alfredo Benso

Problem #1 (10 points)

Identify the following statements as either true or false:

1. A race condition exists if two or more *inputs* change simultaneously (2 pts)
FALSE: a race condition exists if two or more *state variables* change simultaneously
2. For a given input combination, the corresponding input column makes the circuit unstable if there are no stable states in the column (2 pts)
TRUE
3. An asynchronous circuit is working in fundamental mode under the assumption that only one input changes at a time (2 pts)
TRUE
4. If a circuit has been designed in fundamental mode, it is guaranteed to work also in Input/Output mode (2 pts)
FALSE
5. Sufficient condition for two states to be equivalent is that with the same inputs, they transit to the same equivalent states (2 pts)
FALSE: they also must have the same outputs

Problem #2 (15 points)

Design a fundamental mode asynchronous circuit with two inputs A and B, and one output U. The output is 1 only after receiving one of the following two sequences: A, B = 01 - 11 or A, B = 11 - 01. The final part of a sequence can be used as the beginning of the following one. (Show all work!)

1. Derive the primitive transition table (8 pts)
2. Obtain the reduced transition table (2 pts)
3. Derive a race free binary state assignment, and (3 pts)
4. Obtain the Boolean expressions for the State Variables and U (2 pts)

#2: Transition table

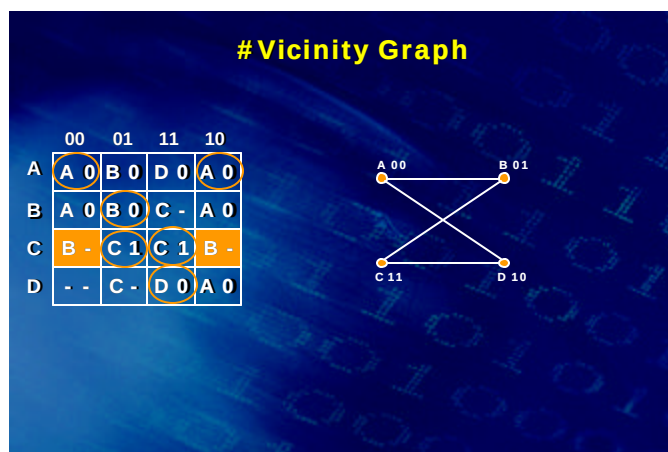
	00	01	11	10
A	A 0	B 0	D 0	A 0
B	A 0	B 0	C -	- -
C	A -	C 1	C 1	A -
D	- -	E -	D 0	A 0
E	A -	E 1	E 1	A -

Equivalent

	00	01	11	10
A	A 0	B 0	D 0	A 0
B	A 0	B 0	C -	- -
C	A -	C 1	C 1	A -
D	- -	C -	D 0	A 0

Notes:

- It is also ok if you directly obtained the minimized transition table.
- If the behavior of the circuit is correct, it is also ok if your states are ordered differently than in this solution



Notes:

- The coding shown in the figure is not the only one correct. Moreover, the choice of the state coding affects the final Output and Future State Boolean functions that are therefore omitted.
- Since it was not specified in the text of the problem, non Hazard-free K-maps coverage will be considered correct.