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# RACES

A decorative graphic on the left side of the slide. It features several vertical orange lines of varying thicknesses. Overlaid on these lines are five orange circles of different sizes. One of the circles, which is medium-sized, contains the white number '1'.

1

# RACES

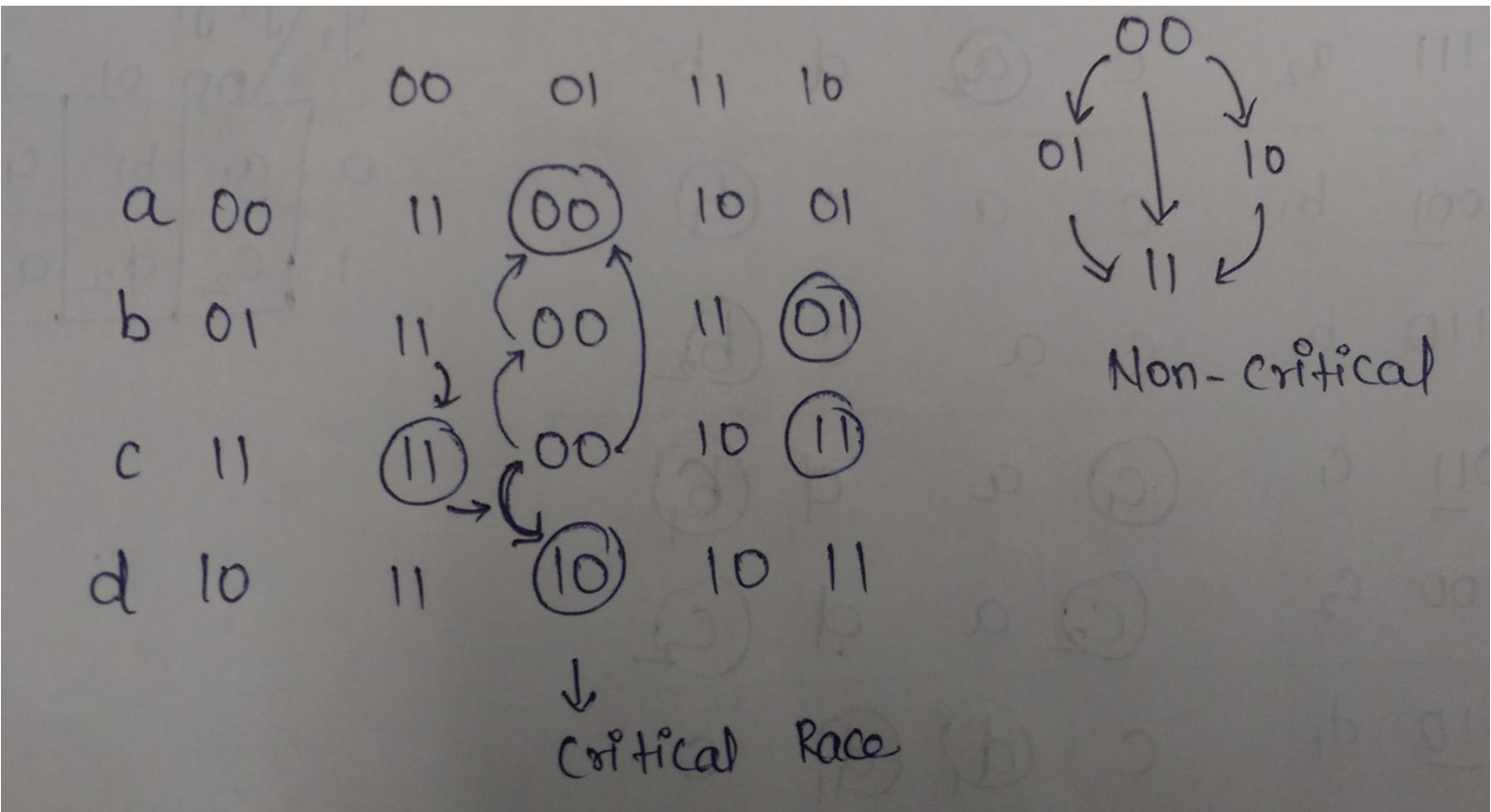
- ONE INPUT CHANGES → MULTIPLE INTERNAL VARIABLES CHANGE STATE
- NON-CRITICAL RACE
- CRITICAL RACE

# RACE-FREE ASSIGNMENT OF STATES

- ADJACENCY DIAGRAM
- $n$ -CUBE:  $2^n$  VERTICES LABELED WITH  $n$ -BIT STRINGS; EACH VERTEX ADJACENT TO  $n$  OTHERS WHOSE LABELS DIFFER IN ONE BIT
- **RACE-FREE ASSIGNMENT:** MAP NODES AND ARCS OF ADJACENCY DIAGRAM ONTO NODES AND ARCS OF  $n$ -CUBE

# RACES

- CRITICAL
- NON CRITICAL



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	00	01	11	10
a	00	c	d	b
b	01	c	c	(b)
c	11	(c)	d	(c)
d	10	c	(d)	c

		00	01	11	10	
$\downarrow$	<u>000</u>	$a_1$	$c$	$\textcircled{a_1}$	$d$	$b$
$\rightarrow$	<u>111</u>	$a_2$	$c$	$\textcircled{a_2}$	$d$	$b$
Inverse	<u>001</u>	$b_1$	$c$	$a$	$c$	$\textcircled{b_1}$
	<u>110</u>	$b_2$	$c$	$a$	$c$	$\textcircled{b_2}$
	<u>011</u>	$c_1$	$\textcircled{c_1}$	$a$	$d$	$\textcircled{c_1}$
	<u>100</u>	$c_2$	$\textcircled{c_2}$	$a$	$d$	$\textcircled{c_2}$
	<u>010</u>	$d_1$	$c$	$\textcircled{d_1}$	$\textcircled{d_1}$	$c$
	<u>101</u>	$d_2$	$c$	$\textcircled{d_2}$	$\textcircled{d_2}$	$c$

	$y_3$	$y_2$	$y_1$	
	00	01	11	10
0	$a_1$	$b_1$	$c_1$	$d_1$
1	$c_2$	$d_2$	$a_2$	$b_2$

		00	01	11	10
000	$a_1$	$c_2$	$a_1$	$d_1$	$b_1$
111	$a_2$	$c_1$	$a_2$	$d_2$	$b_2$
001	$b_1$	$c_2$	$a_1$	$c_1$	$b_1$
110	$b_2$	$c_1$	$a_2$	$c_2$	$b_2$
011	$c_1$	$c_1$	$a_2$	$d_1$	$c_1$
100	$c_2$	$c_2$	$a_1$	$d_2$	$c_2$
010	$d_1$	$c_1$	$d_1$	$d_1$	$c_1$
101	$d_2$	$c_2$	$d_2$	$d_2$	$c_2$