ALU Slices PLA truth tables

Instructor: Prof. Lei

Instructions: Fill in the PLA outputs columns and obtain TS, Co, and R minterms based on the PLA outputs

Slices 1-30	PLA inputs		PLA outputs				TS minterms	Co minterms	R minterms
	In8..3	In2..0	Out2	Out1	Out0				
Instruction	func5..0	ABC	TS	Co	R				
add/addu	10000x	000	0	0	0		1xxxxxxx		
	10000x	001	0	0	1				10000x001
	10000x	010	0	0	1				10000x010
	10000x	011	0	1	0			10000x011	
	10000x	100	0	0	1				10000x100
	10000x	101	0	1	0			10000x101	
	10000x	110	0	1	0			10000x110	
	10000x	111	0	1	1			10000x111	10000x111
sub/subu	10001x	000	0	0	1			10001x000	
	10001x	001	0	1	0			10001x001	
	10001x	010	0	0	0				
	10001x	011	0	0	1				10001x011
	10001x	100	0	1	0			**10001x100**	
	10001x	101	0	1	1			10001x101	10001x101
	10001x	110	0	0	1				10001x110
	10001x	111	0	1	0			10001x111	
and	100100	000	0	0	0				
	100100	001	0	0	0				
	100100	010	0	0	0				
	100100	011	0	0	0				
	100100	100	0	0	0				
	100100	101	0	0	0				
	100100	110	0	0	1				100100110
	100100	111	0	0	1				100100111
or	100101	000	0	0	0				
	100101	001	0	0	0				
	100101	010	0	0	1				100101010
	100101	011	0	0	1				100101011
	100101	100	0	0	1				100101100
	100101	101	0	0	1				100101101
	100101	110	0	0	1				100101110
	100101	111	0	0	1				100101111
xor	100110	000	0	0	0				
	100110	001	0	0	1				100110001
	100110	010	0	0	1				100110010
	100110	011	0	0	0				
	100110	100	0	0	1				100110100
	100110	101	0	0	0				
	100110	110	0	0	0				
	100110	111	0	0	1				100110111
nor	100111	000	0	0	1				100111000
	100111	001	0	0	1				100111001
	100111	010	0	0	0				
	100111	011	0	0	0				
	100111	100	0	0	0				
	100111	101	0	0	0				
	100111	110	0	0	0				
	100111	111	0	0	0				
slt	101010	000	0	0	0				
	101010	001	0	1	0			101010001	
	101010	010	0	0	0				
	101010	011	0	0	0				
	101010	100	0	1	0			**101010100**	
	101010	101	0	1	0			101010101	
	101010	110	0	0	0				
	101010	111	0	1	0			101010111	
sltu	101011	000	0	0	0				
	101011	001	0	1	0			101011001	
	101011	010	0	0	0				
	101011	011	0	0	0				
	101011	100	0	1	0			**101011100**	
	101011	101	0	1	0			101011101	
	101011	110	0	0	0				
	101011	111	0	1	0			101011111	

Slice MSB	PLA inputs		PLA outputs				Ov minterms	TS minterms	slt minterms	R minterms
	In8..3	In2..0	Out3	Out2	Out1	Out0				
Instruction	func5..0	ABC	Ov	TS	slt	R	Ov minterms	TS minterms	slt minterms	R minterms
add/addu	10000x	000	0	0	0	0		1xxxxxxx		
	10000x	001	1	0	0	1	10000x001			10000x001
	10000x	010	0	0	0	1				10000x010
	10000x	011	0	0	0	0				
	10000x	100	0	0	0	1				10000x100
	10000x	101	0	0	0	0				
	10000x	110	1	0	0	0	10000x110			
	10000x	111	0	0	0	1				10000x111
sub/subu	10001x	000	0	0	0	1				10001x000
	10001x	001	0	0	0	0				
	10001x	010	0	0	0	0				
	10001x	011	1	0	0	1	10001x011			10001x011
	10001x	100	1	0	0	0	10001x100			
	10001x	101	0	0	0	1				10001x101
	10001x	110	0	0	0	1				10001x110
	10001x	111	0	0	0	0				
and	100100	000	0	0	0	0				
	100100	001	0	0	0	0				
	100100	010	0	0	0	0				
	100100	011	0	0	0	0				
	100100	100	0	0	0	0				
	100100	101	0	0	0	0				
	100100	110	0	0	0	1				100100110
	100100	111	0	0	0	1				100100111
or	100101	000	0	0	0	0				
	100101	001	0	0	0	0				
	100101	010	0	0	0	1				100101010
	100101	011	0	0	0	1				100101011
	100101	100	0	0	0	1				100101100
	100101	101	0	0	0	1				100101101
	100101	110	0	0	0	1				100101110
	100101	111	0	0	0	1				100101111
xor	100110	000	0	0	0	0				
	100110	001	0	0	0	1				100110001
	100110	010	0	0	0	1				100110010
	100110	011	0	0	0	0				
	100110	100	0	0	0	1				100110100
	100110	101	0	0	0	0				
	100110	110	0	0	0	0				
	100110	111	0	0	0	1				100110111
nor	100111	000	0	0	0	1				100111000
	100111	001	0	0	0	1				100111001
	100111	010	0	0	0	0				
	100111	011	0	0	0	0				
	100111	100	0	0	0	0				
	100111	101	0	0	0	0				
	100111	110	0	0	0	0				
	100111	111	0	0	0	0				
slt	101010	000	0	0	1	0			101010 001	
	101010	001	0	0	0	0				
	101010	010	0	0	0	0				
	101010	011	0	0	0	0				
	101010	100	0	0	1	0			101010 100	
	101010	101	0	0	1	0			101010 110	
	101010	110	0	0	1	0			101010 111	
	101010	111	0	0	0	0				
sltu	101011	000	0	0	1	0			101010 000	
	101011	001	0	0	0	0				
	101011	010	0	0	1	0			101010 010	
	101011	011	0	0	1	0			101010 011	
	101011	100	0	0	0	0				
	101011	101	0	0	0	0				
	101011	110	0	0	1	0			101010 110	
	101011	111	0	0	0	0				

Slice 0	PLA inputs		PLA outputs			TS minterms	Co minterms	R minterms
	In8..3	In2..0	Out2	Out1	Out0			
Instruction	func5..0	A B slt	TS	Co	R	TS minterms	Co minterms	R minterms

add/addu	10000x	000	0	0	0	**1xxxxxxx**		
	10000x	001	0	0	1			10000x001
	10000x	010	0	0	1			10000x010
	10000x	011	0	1	0		10000x011	
	10000x	100	0	0	1			10000x100
	10000x	101	0	1	0		10000x101	
	10000x	110	0	1	0		10000x110	
	10000x	111	0	1	1		10000x111	10000x111
sub/subu	10001x	000	0	0	1			10001x000
	10001x	001	0	1	0		10001x001	
	10001x	010	0	0	0			
	10001x	011	0	0	1			10001x011
	10001x	100	0	1	0		**10001x100**	
	10001x	101	0	1	1		10001x101	10001x101
	10001x	110	0	0	1			10001x110
	10001x	111	0	1	0		10001x111	
and	100100	000	0	0	0			
	100100	001	0	0	0			
	100100	010	0	0	0			
	100100	011	0	0	0			
	100100	100	0	0	0			
	100100	101	0	0	0			
	100100	110	0	0	1			100100110
	100100	111	0	0	1			100100111
or	100101	000	0	0	0			
	100101	001	0	0	0			
	100101	010	0	0	1			100101010
	100101	011	0	0	1			100101011
	100101	100	0	0	1			100101100
	100101	101	0	0	1			100101101
	100101	110	0	0	1			100101110
	100101	111	0	0	1			100101111
xor	100110	000	0	0	0			
	100110	001	0	0	1			100110001
	100110	010	0	0	1			100110010
	100110	011	0	0	0			
	100110	100	0	0	1			100110100
	100110	101	0	0	0			
	100110	110	0	0	0			
	100110	111	0	0	1			100110111
nor	100111	000	0	0	1			100111000
	100111	001	0	0	1			100111001
	100111	010	0	0	0			
	100111	011	0	0	0			
	100111	100	0	0	0			
	100111	101	0	0	0			
	100111	110	0	0	0			
	100111	111	0	0	0			
slt	101010	000	0	0	0			
	101010	001	0	1	0		101010001	
	101010	010	0	0	0			
	101010	011	0	0	0			
	101010	100	0	1	0		**101010100**	
	101010	101	0	1	0		101010101	
	101010	110	0	0	0			
	101010	111	0	1	0		101010111	
sltu	101011	000	0	0	0			
	101011	001	0	1	0		101011001	
	101011	010	0	0	0			
	101011	011	0	0	0			
	101011	100	0	1	0		**101011100**	
	101011	101	0	1	0		101011101	
	101011	110	0	0	0			
	101011	111	0	1	0		101011111	