CS 4141 — Digital Systems Laboratory, Lab 4 — Pre-Lab

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Learn about D Flip-Flop IC 7474. Draw truth table for the output Q and Q'. Consider all inputs including Clock, CLEAR (Reset), PRESET and data pin D.

CLK	CLEAR	PRESET	D	Q	Q'
X	1	0	X	1	0
X	0	1	X	0	1
X	0	0	X	H↑	H↑
↑	1	1	1	1	0
↑	1	1	0	0	1
0	1	1	X	Q0	Q'0

Learn about JK Flip-Flop IC 74107. Draw truth table for the output Q and Q'. Consider all inputs including Clock, Clear, data pin J, and data pin K.

CLEAR	CLK	J	K	Q	Q'
0	X	X	X	0	1
1	↓	0	0	Q(prev)	Q'(prev)
1	↓	1	0	1	0
1	↓	0	1	0	1
1	↓	1	1	1	0
1	1	X	X	Q(prev)	Q'(prev)

This problem involves building a tiny ALU performing 4-bit addition and using two 74SL74 (4 DFF's) and a 4-bit adder. Provide an implementation to perform the following ALU addition operation. Add A,B – This operation adds register A and input B and stores the result in register A. Create a 4-bit register using 4 D FFs which acts as an accumulator. This accumulator is connected with an adder and is performing the following task. The initial value of the accumulator is 0 and every time a clock pulse is given, it adds the current value of the accumulator (let's call it A) and a given 4-bit input B. The B input is provided using 4 input switches. Thus, the accumulator stores the addition of multiple 4-bit values provided to the ALU. Draw the Logic Diagram of a tiny ALU with DFF Accumulator. Use logical symbols, not IC chips. A logical diagram should contain block notations (such as Full Adder, D Flip-Flop, Decoder, Multiplexer) and gate symbols (such as AND, OR, and NOT).