

Title: IC RIPPLE COUNTERS**Materials:**

- [1] 7493 4-bit binary counter
- [1] clock (single pulse)

Procedure:

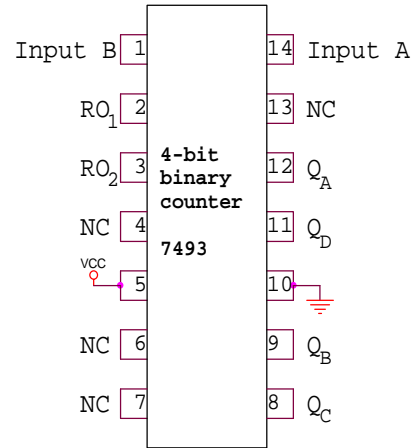
1. **Draw** a wiring diagram of a 4-bit counter (mod-16) (use the back and use a ruler). Use a 7493 and four LED's (as was done in class). Show what each of the legs of the 7493 is hooked to (clk, input A, input B, Q_D, Q_C, Q_B, Q_A, RO₁, and RO₂). The four outputs (Q_D, Q_C, Q_B, and Q_A) should be hooked to the 4 LED's that were hooked to the 7447 since lab 9 - and should still be in your board). Your counter should display on the 7-segment display.
2. Wire the circuit you drew in step 1.
3. Operate and record the results in Table 14. **Get Instructor's Signature.**
4. **Draw** a wiring diagram of a modulo-10 counter (decade counter) as drawn in class (use the back and use a ruler). Use a 7493 and four LED's (as was done in class). Show what each of the legs of the 7493 is hooked to (clk, input A, input B, Q_D, Q_C, Q_B, Q_A, RO₁, and RO₂). The four outputs (Q_D, Q_C, Q_B, and Q_A) should be hooked to the 4 LED's that were hooked to the 7447 since lab 9 - and should still be in your board). Your counter should display on the 7-segment display.
5. Wire the circuit you drew in step 4.
6. Operate and record the results in Table 14. **Get Instructor's Signature.**

Questions: (answer on a separate piece of paper – **“Draw” means you must use a template**):

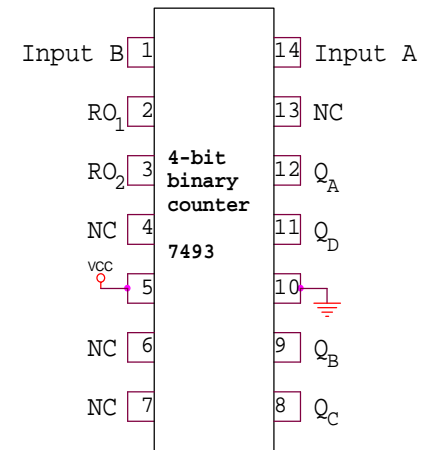
1. **Draw** a logic diagram of a mod-9 counter using a 7493. Label all pins and show what they are connected to (use the back and use a ruler).
2. List the counting sequence of the mod-9 counter you drew in the last question. You should use binary and list 10 consecutive numbers starting with zero.
3. The 7493 IC is _____ (ripple-, synchronous-) type counter.
4. The 7493 IC counter will count _____ (up, down, both up and down).
5. **Draw** a logic diagram of a mod-6 counter using a 7493 IC. Label all pins and show what they are connected to (use the back and use a ruler).
6. List the counting sequence of the mod-6 counter you drew in the last question. You should use binary and list 7 consecutive numbers starting with zero.

Input Pulse Number	Output								Digital Readout
	4-bit ripple up counter				4-bit mod-10 counter				
	D	C	B	A	D	C	B	A	
0	0	0	0	0	0	0	0	0	
1									
2									
3									
4									
5									
6									
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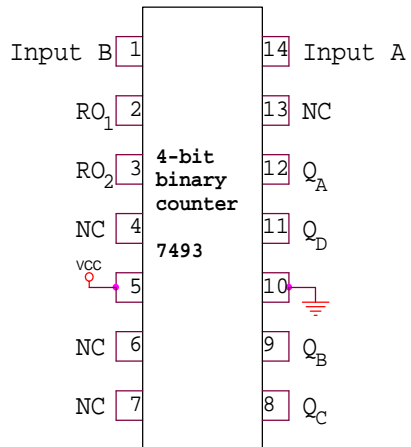
Table 14 TT for 2 counters



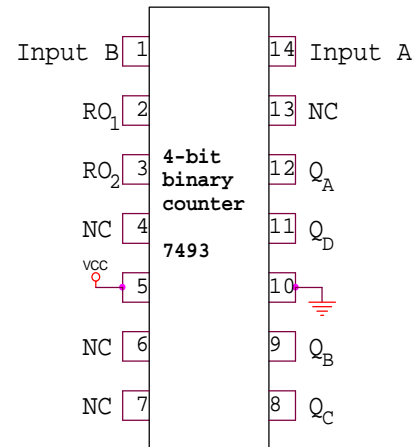
use this for **Question 1 (mod-9)**



use this for **Question 5 (mod-6)**



use this for **Procedure 1 (mod-16)**



use this for **Procedure 4 (mod-10)**