Name: .... Student ID: ....

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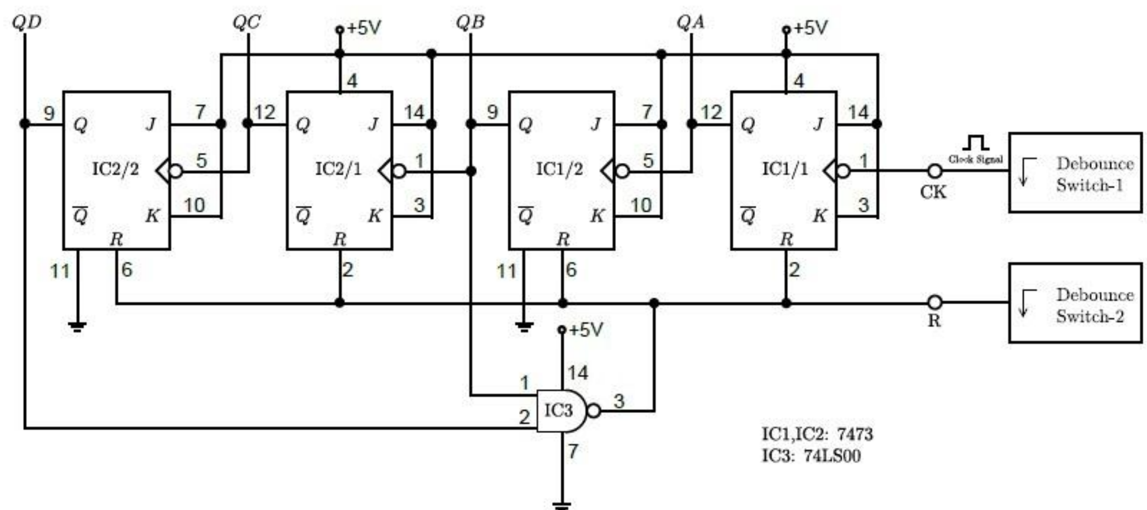
Laboratory 12

Counter Circuit

1. Connect a logic circuit as shown in the following figure.



2. Connect pin *CK* and *R* to the falling edge output of the debounce swtich 1 and 2 respectively.
3. Initially reset a counter by applying a pulse 0 to pin *R*. This can be done by pressing the de-bounce switch 2 once.
4. Apply a number of pulses through pin CK one at a time and record the experiment results of QA, QB, QC, and QD in the following table.

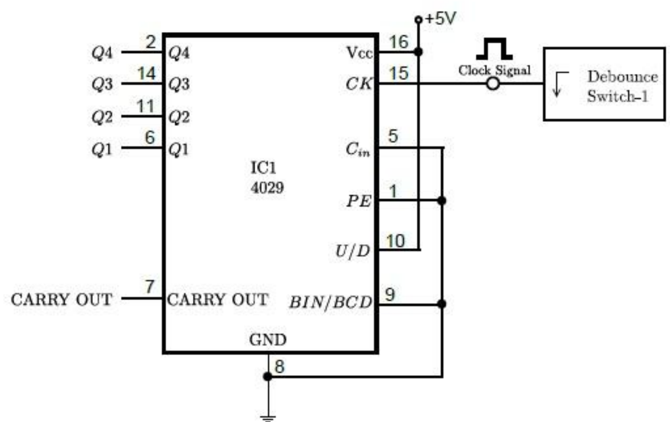
Pulse No.	QA	QB	QC	QD
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				

Instructor’s signature

5. Specify the type, range, and number of bit of the counter for the previous circuit?

Instructor's signature

6. Connect the circuit as shown in the following figure



7. Connect the output pin CARRY OUT to the logic monitor and press a debounce switch once.

8. Apply a pulse to start counting one at a time using a debounce switch. Observe the output via logic monitor and record the results in the following table.

Pulse No.	QA	QB	QC	QD	C_{out}
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					

Instructor's signature

9. Disconnect pin no. 10 of IC1 from the supply voltage and connect it to a ground. Press the debounce switch once then redo the experiment as before.
10. Record the experimental results in the following table.

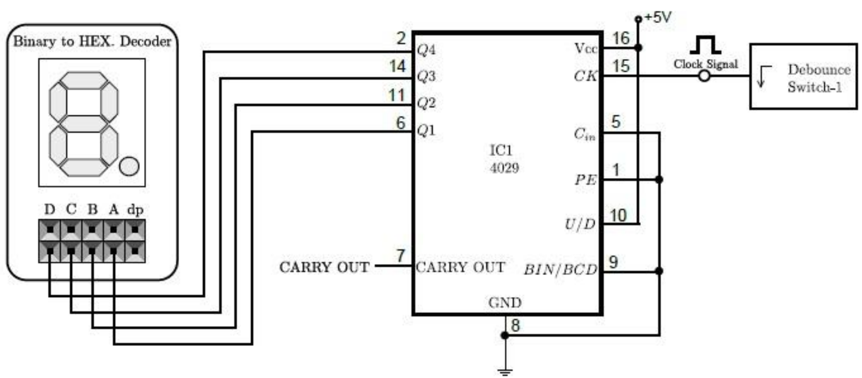
Pulse No.	QA	QB	QC	QD	C_{out}
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					

Instructor's signature

11. What can be concluded from these previous two experiments?

Instructor's signature

12. Connect the circuit as shown below.



13. The output pin CARRY OUT should be connected to the logic monitor. Press a debounce switch once.

14. Apply a pulse by pressing the debounce switch one at a time. Observe the output via LED of seven segments of the BINARY TO HEX. DECODER circuit. Record the result in the following table.

Pulse No.	Display of 7-Segments	C_{out}
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

Instructor's signature

15. **<u>Assignments:</u>**

15.1 Design a stopwatch circuit, which can count the number from 0 to 59. The outputs of this circuit are LED D7 to D2 which show the number in binary and D0 that is the alarm. When the number is more than 59, D0 will be changed from 'LO' to 'HIGH' or 'HIGH' to 'LO' signal and D7 to D2 will be set to '000000'.

Instructor's signature

15.2 Construct a traffic junction control circuit used for both vehicles and pedestrians which counts down from 0-9 under the following conditions:

a) Receive a 4-bit BCD by using SW3 to SW0 which SW0 is the LSB.

b) Display the count down numbers using two 7-segments for vehicles and pedestrians. When the 7-segment is ‘0’, the next value of 7-segment is equal to a 4-bit BCD from SW3 to SW0.

c) Show the results of traffic light using logic monitors. Use D7 and D0 to display the traffic light for pedestrians and vehicles, respectively. If the 7-segment is ‘0’, the traffic light will be changed from ‘HIGH’ to ‘LOW’ or ‘LOW to ‘HIGH’ signal. Note that D7 and D0 must not be the same and the red light gives ‘HIGH’ signal.

Instructor’s signature

<u>Logic Diagram of frequently used gates</u>