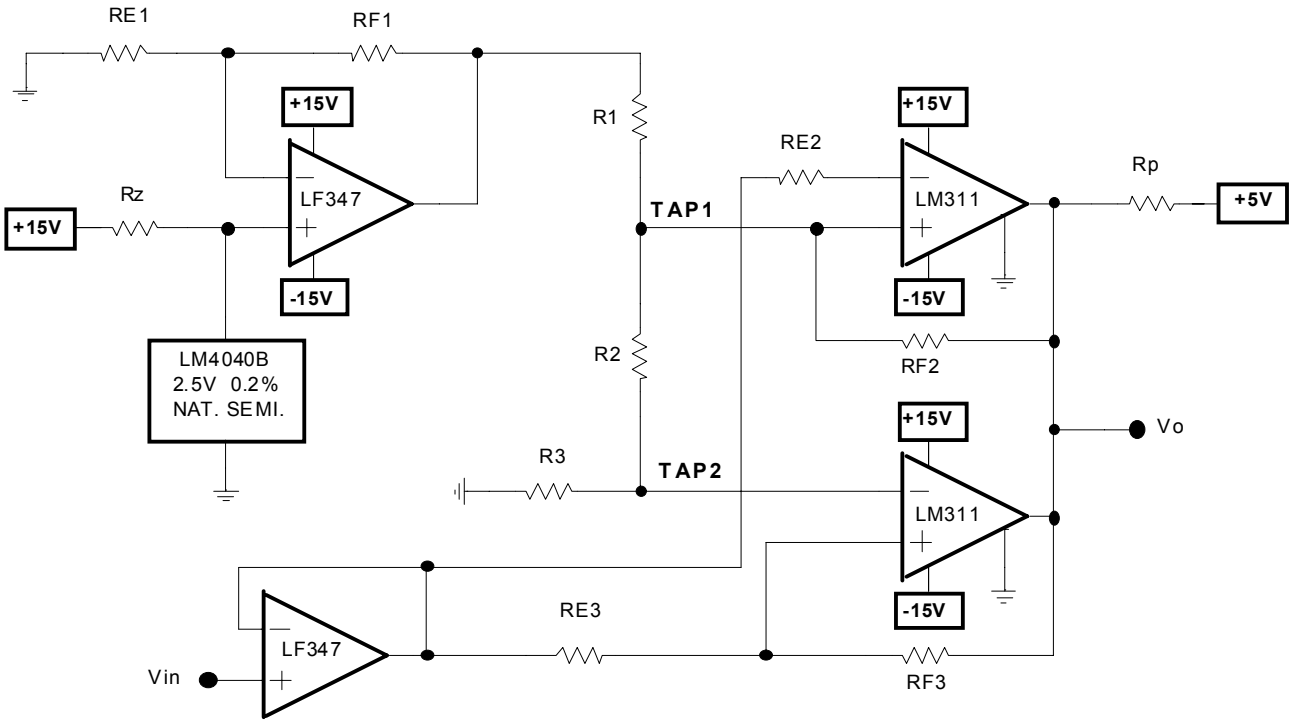
ELECTRONICS 2 CE LAB

WINDOW COMPARATOR .

CIRCUIT DIAGRAM



PRE-LAB

Design the above window comparator according to the following specifications.

#	V_{LO}	V_{HI}	HYSTERESIS	#	V_{LO}	V_{HI}	HYSTERESIS
1	2	2.8	0.05	**7**	5	7	0.05
2	2.5	3.5	0.06	**8**	5.5	7.7	0.06
3	3	4.2	0.07	**9**	6	8.4	0.07
4	3.5	4.9	0.08	**10**	6.5	9.1	0.08
5	4	5.6	0.09	**11**	7	9.8	0.09
6	4.5	6.3	0.1	**12**	7.5	10.5	0.1

Bias the precision reference IC with 1 to 2 mA. Reference is accurate to 0.2%.

Available 5% standard resistors

1	1.2	1.5	1.8	2.2	2.7	x 10^N
3.3	3.9	4.7	5.6	6.8	8.2	N= … -3,-2,-1,0,1,2,3 …

Supply a circuit diagram with all standard resistor values labeled directly on the diagram. You combine two standard values to make up one resistor three times at the most in the entire circuit. Provide all of your work for the pre-lab.

PROCEDURE

Microcap Simulation

1. Apply a 1 kHz triangular wave to the input and set proper peak voltages to be able to detect the two levels you have been assigned. Display waveforms of V_o, V^+ of each comparator and V_{in}. Label detection levels (V_{in} values) when V_{in} goes up and when V_{in} goes down. Also label values of V^+ at detection points and show hysteresis.

Lab Procedure

1. Assemble the circuit and measure the voltage divider tap voltages for the three possible conditions of V_{in} – use a DC input voltage derived from a 20k pot for V_{in}.

	$V_{in} < V_{LO}$	$V_{LO} < V_{in} < V_{HI}$	$V_{in} > V_{HI}$
V_{TAP1}			
V_{TAP2}			

2. Now still using a DC input voltage, measure the trip levels of the widow comparator by measuring the input voltage levels that toggle the final O/P when V_{in} goes up and when V_{in} goes down.

	V_{in} goes up Starting below V_{LO}	V_{in} goes down Starting above V_{HI}	**Hysteresis** (measured)	**Hysteresis** (theory)
V_{in} low trip level				
V_{in} high trip level				

3. Apply a 100 Hz triangular wave to the input and set proper peak voltages to be able to detect the two levels you have been assigned. Remove the feedback resistors of the two voltage comparators and display waveforms of V_o and V_{in}.. Observe the crossover oscillations on V_o by using the second time base of the scope to zoom in on the edges of V_o See instructor demo on how to use the second time base of the scope.

4. Now re-connect the feedback resistors and and observe the edges of V_o and ensure that they do not chatter. If they do chatter, you may have to change the ground layout and/or by-pass the chip supplies properly.

Observe V_o and V_{in} on the scope and measure all relevalnt voltages – peak voltages, trip levels when V_{in} goes up and trip levels when V_{in} goes down. Sketch waveforms and label all measured values.

5. Observe V_o and V^+ of the top comparator and sketch the waveforms with measured voltage levels. How much hysteresis do you measure on V^+?

6. Repeat step 5 for the bottom comparator.

POST LAB

Compare all measured data to simulated and predicted values. Highlight major discrepancies and explain possible causes of error.