ECE 320 - Quiz #5 - Name _____

555 Timers, Transistor Switch, Comparitors, Schmitt Triggers - Spring 2023

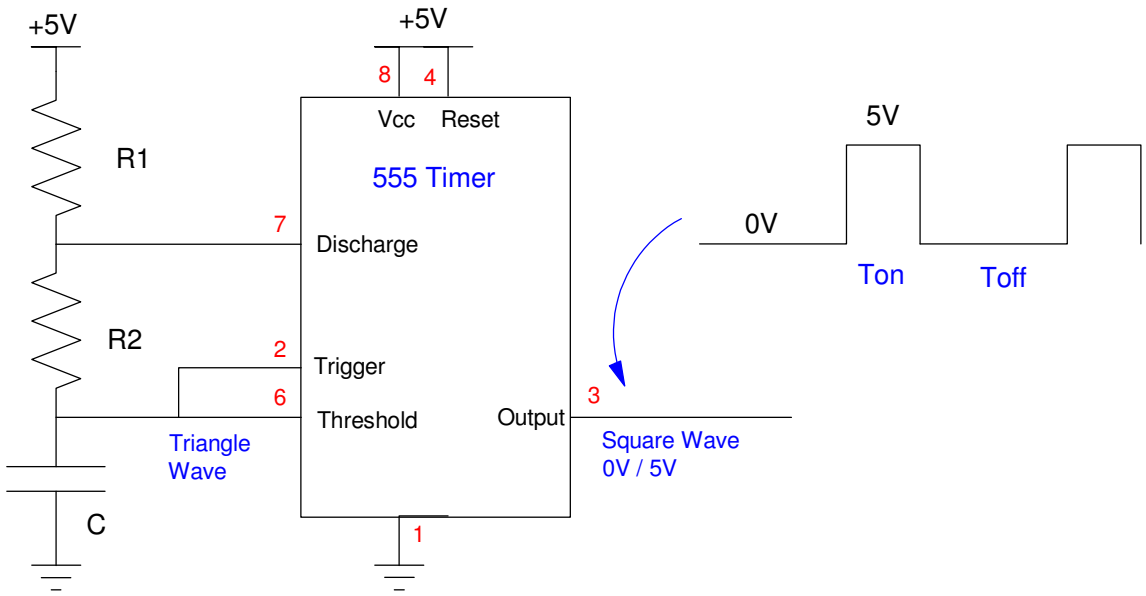
1) 555 Timers. Determine R1 and R2 so that the 555 timer outputs a 20% duty cycle 100Hz square wave:

$$t_{on} = (R_1 + R_2) \cdot C \cdot \ln(2) = 2.000ms$$

$$t_{off} = R_2 \cdot C \cdot \ln(2) = 8.000ms$$

Let C be your birthday day in microfarads (800 + 100*Month + Day) uF

R1	R2	C (800 + 100*Month + Day) uF



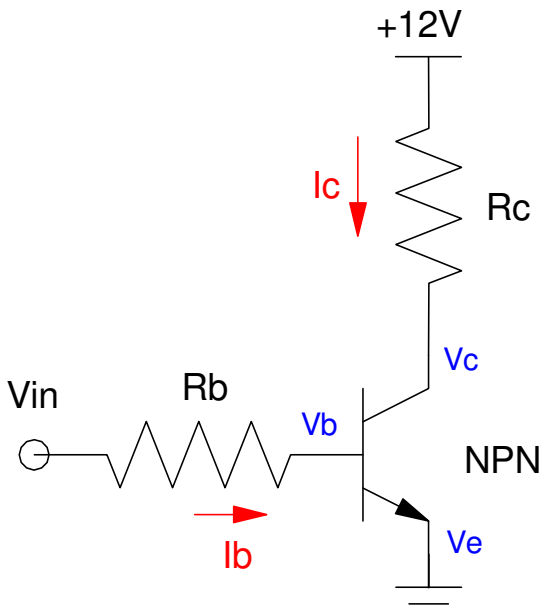
2) Transistor Switch: Design. Specify R1 and R2 so that when Vin = 5.00V,

- Ic = (800 + 100*Birth Month + Birth Day) mA.
- The transistor is saturated, and
- Ib < 25mA (the maximum output of a 555 timer)

Assume 6144 transistors

- | Vbe | = 0.7V
- | Vce | = 0.2V when saturated
- $\beta = 200$

Ic (mA) 800 + 100*(Mo) + (Day)	Rc	min value of Rb	max value of Rb

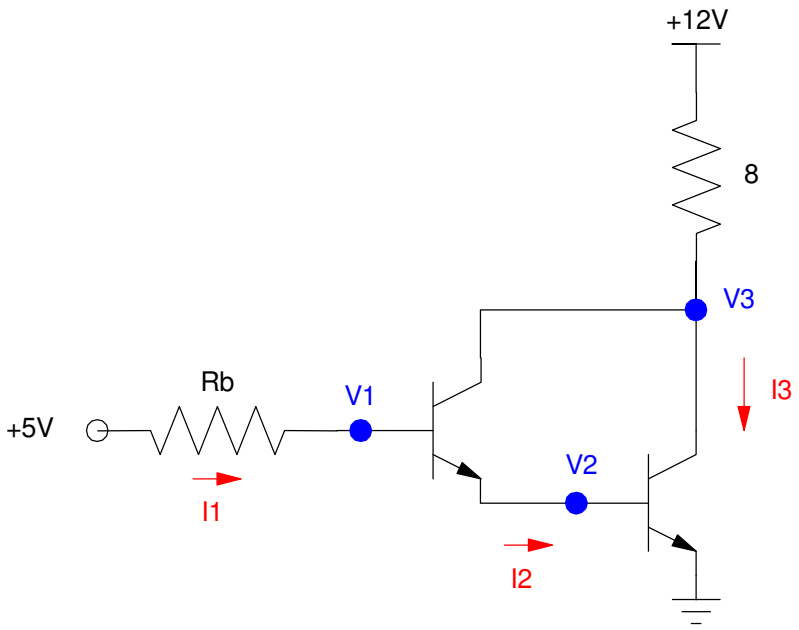


3) Darlington Pair (analysis). Assume two 6144 NPN transistors are connected as a Darlington pair.

- | Vbe | = 0.7V
- | Vce | = 0.2V when saturated
- $\beta = 200$

Let Rb be 800 + 100(Birth Month) + Birth Day. Find the currents and voltages.

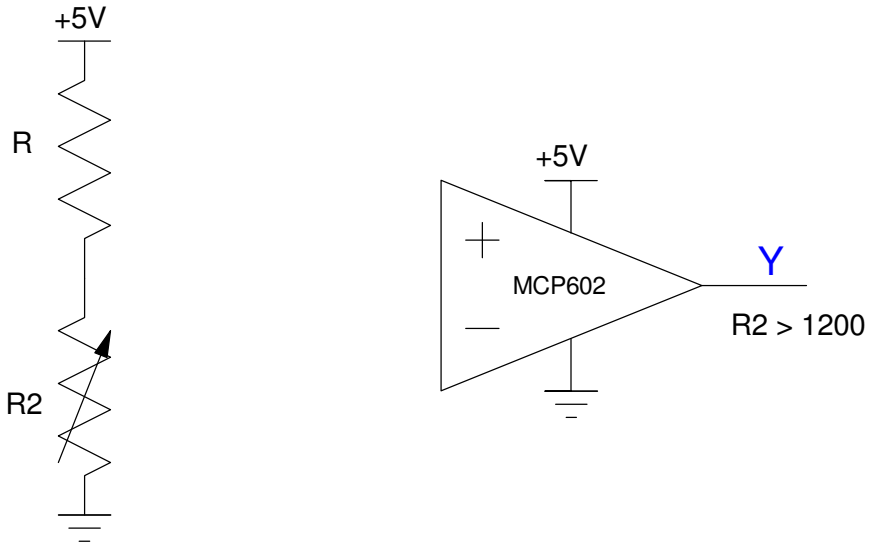
Rb 800 + 100*Mo + Day	I1	I2	I3
	V1	V2	V3



4) Comparitor: Design a circuit which output

- 5V when R2 > 1200 Ohms
- 0V when R2 < 1200 Ohms

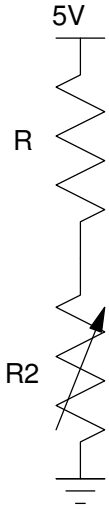
where R = 800 + 100*(Birth Month) + (Birth Day).

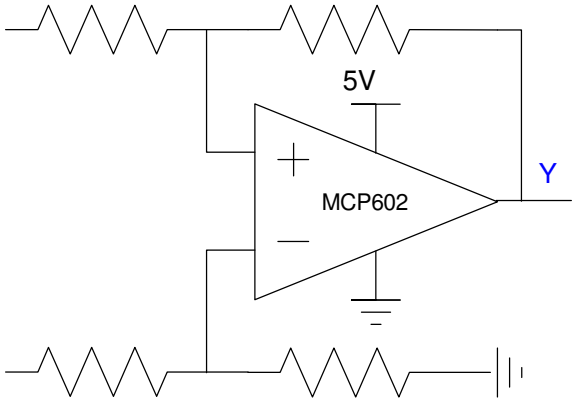


5) Schmitt Trigger: Design a circuit which output

- 5V when R2 < 1200 Ohms
- 0V when R2 > 1300 Ohms
- No change for 1200 < R2 < 1300 Ohms

Let R be 800 + 100(Birth Month) + (Birth Date).





6) Schmitt Trigger: Analysis. Determine the voltages and resistance where the following Schmitt trigger turns on and off. Assume R is 800 + 100*(Birth Month) + (Birth Day).

R 800 + 100*Mo + Day	On (V2 = +5V)		Off (V2 = 0V)	
	V1	R2	V1	R2