ECE 320 - Quiz #5 - Name _____

555 Timers, Transistor Switch, Comparitors, Schmitt Triggers - Fall 2021

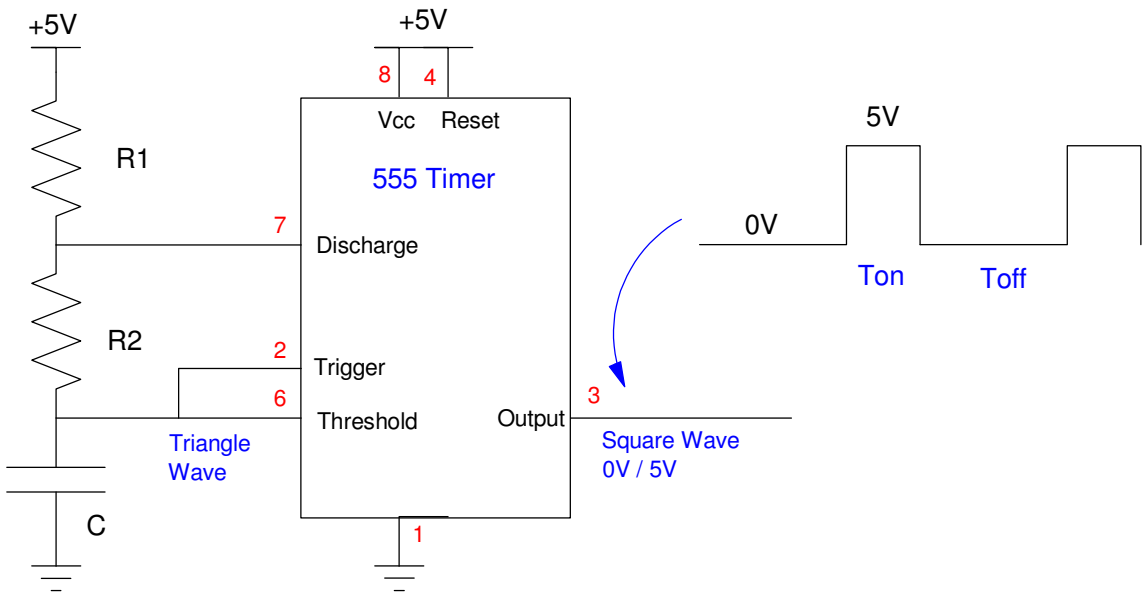
1) 555 Timers. Determine R1, R2, and C so that the 555 timer outputs a 80% duty cycle 100Hz square wave:

$$t_{on} = (R_1 + R_2) \cdot C \cdot \ln(2) = 8.0ms$$

$$t_{off} = R_2 \cdot C \cdot \ln(2) = 2.0ms$$

Let R1 be your birthday day (1000 + 100*Month + Day. May 14th would be 1514 Ohms)

R1 1000 + 100*Month + Day	R2	C



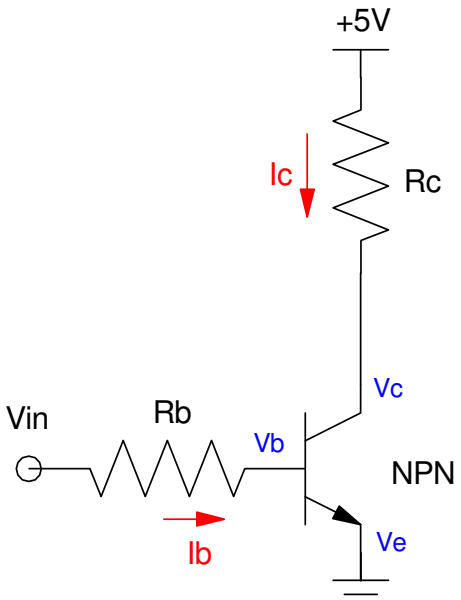
2) Transistor Switch: Design. Specify R1 and R2 so that when Vin = 5.00V,

- Ic = (100*Birth Month + Birth Day) mA. May 14th would be 514mA (0.514A)
- The transistor is saturated, and
- Ib < 25mA (the maximum output of a 555 timer)

Assume 6144 transistors

- | Vbe | = 0.7V
- | Vce | = 0.36V when saturated
- $\beta = 200$

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

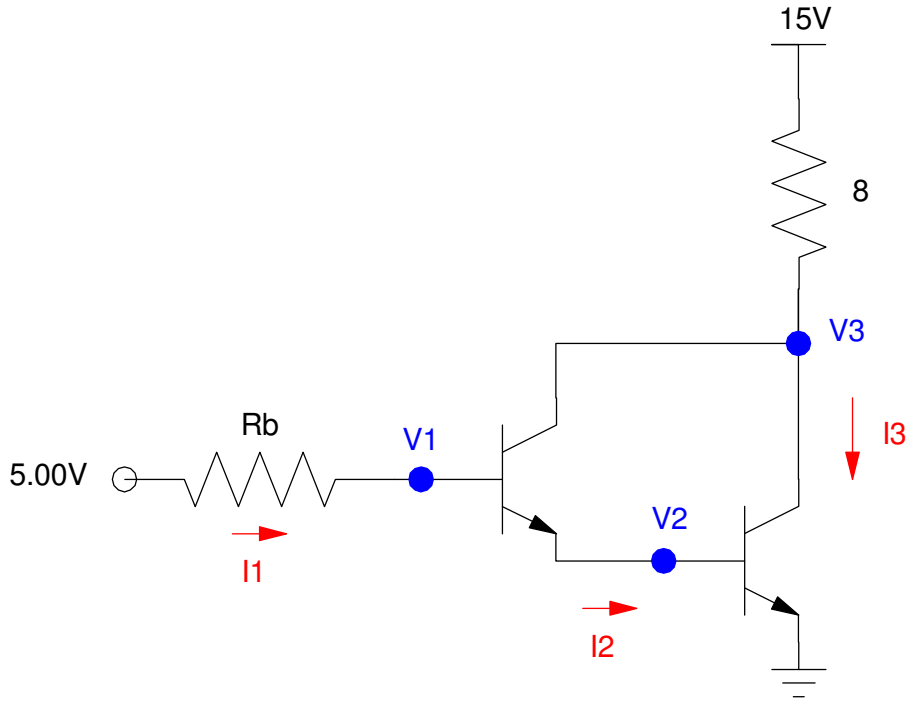


3) Darlington Pair (analysis). Assume two 6144 NPN transistors are connected as a Darlington pair.

- | Vbe | = 0.7V
- | Vce | = 0.36V when saturated
- $\beta = 200$

Let Rb be 1000 + 100(Birth Month) + Birth Day. (May 14 = 1514 Ohms). Find the currents and voltages.

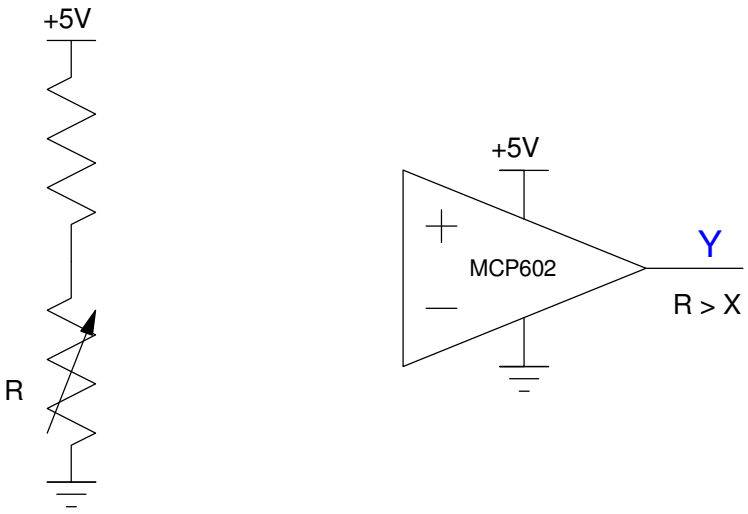
Rb 1000 + 100*Mo + Day	I1	I2	I3
	V1	V2	V3



4) Comparitor: Design a circuit which output

- 0V when R > X Ohms
- 5V when R < X Ohms

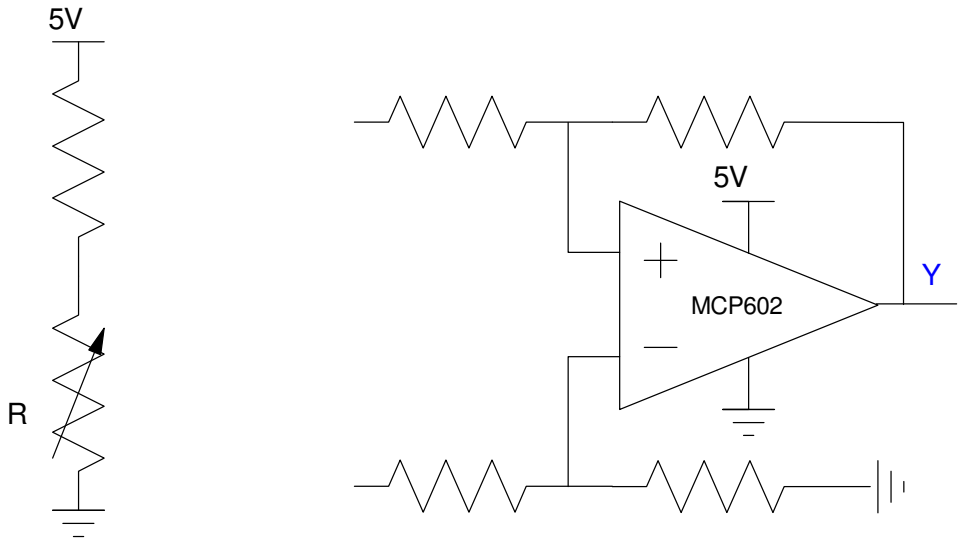
where X is 1000 + 10*(Birth Month) + (Birth Day).



5) Schmitt Trigger: Design a circuit which output

- 5V when R < X Ohms
- 0V when R > X + 400 Ohms
- No change for X < R < X + 400 Ohms

Let X be 1000 + 10(Birth Month) + (Birth Date).



6) Schmitt Trigger: Analysis. Determine the voltages and resistance where the following Schmitt trigger turns on and off. Assume Rx is 1000 + 10*(Birth Month) + (Birth Day). May 14th gives Rx = 1514 Ohms.

Rx 1000 + 10*Mo + Day	On (V2 = +5V)		Off (V2 = 0V)	
	V1	R	V1	R