ECE 320 - Quiz #5 - Name _____

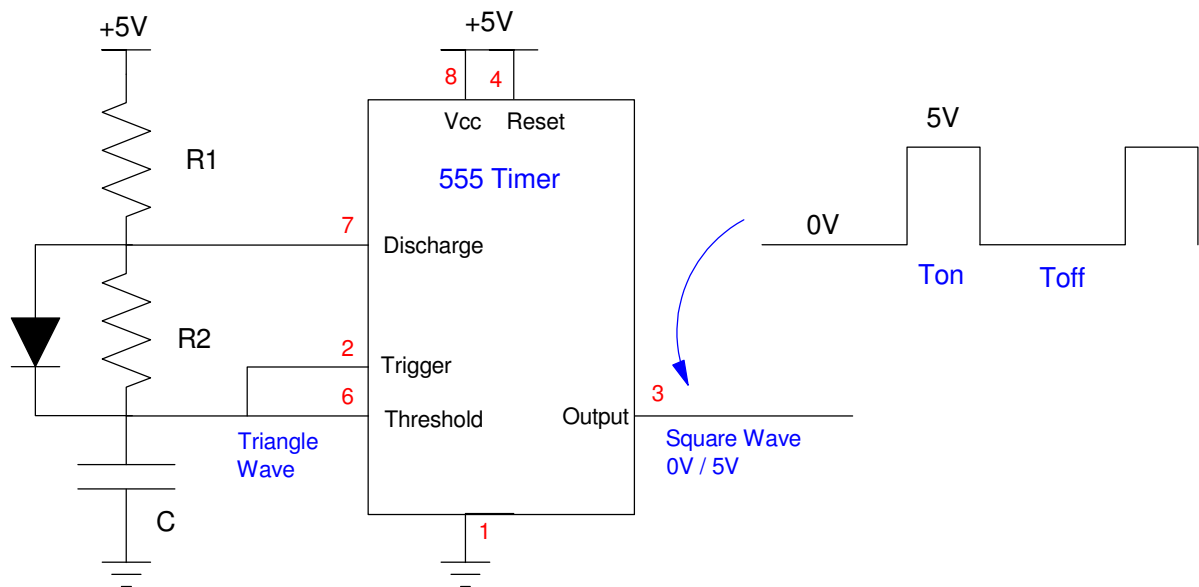1) 555 Timers. For the following circuit, the on and off time is equal to

$$T_{on} \approx 0.6931 R_1 C = 300 \mu s$$

$$T_{off} \approx 0.6931 R_2 C = 700 \mu s$$

Determine R1, R2, and C so that the 555 timer outputs
- A 1kHz square wave (Ton +Toff = 1ms)
- With 30% duty cycle (Ton = 300us, Toff = 700us)
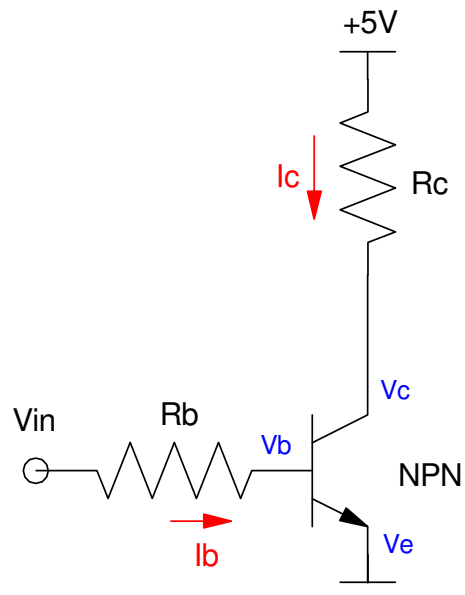
R1	R2	C

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

- Ic = 75mA,
- The transistor is saturated, and
- Ib < 25mA (the maximum output of a 555 timer)

Assume 3904 transistors

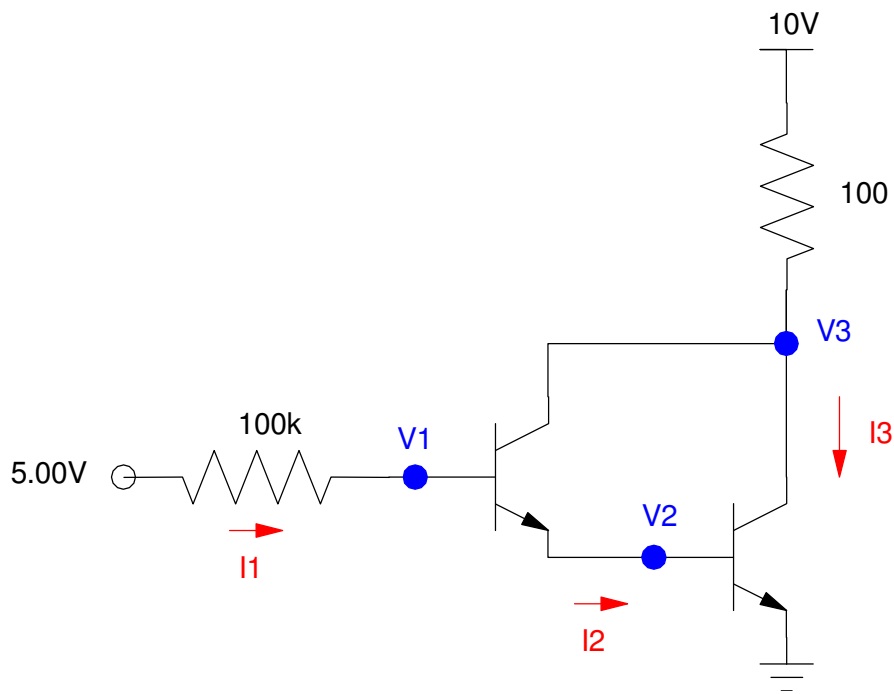- | Vbe | = 0.7V
- | Vce | = 0.2V when saturated
- $\beta = 100$

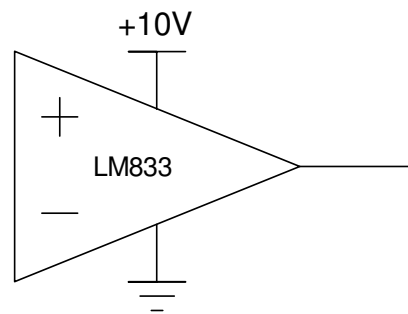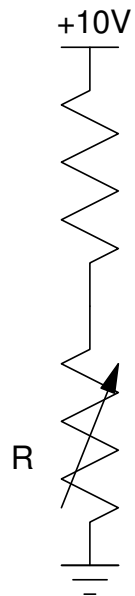| min value of Rb	max value of Rb	Rc

3) Darlington Pair (analysis). Assume two 3904 NPN transistors are connected as a Darlington pair.

- | Vbe | = 0.7V
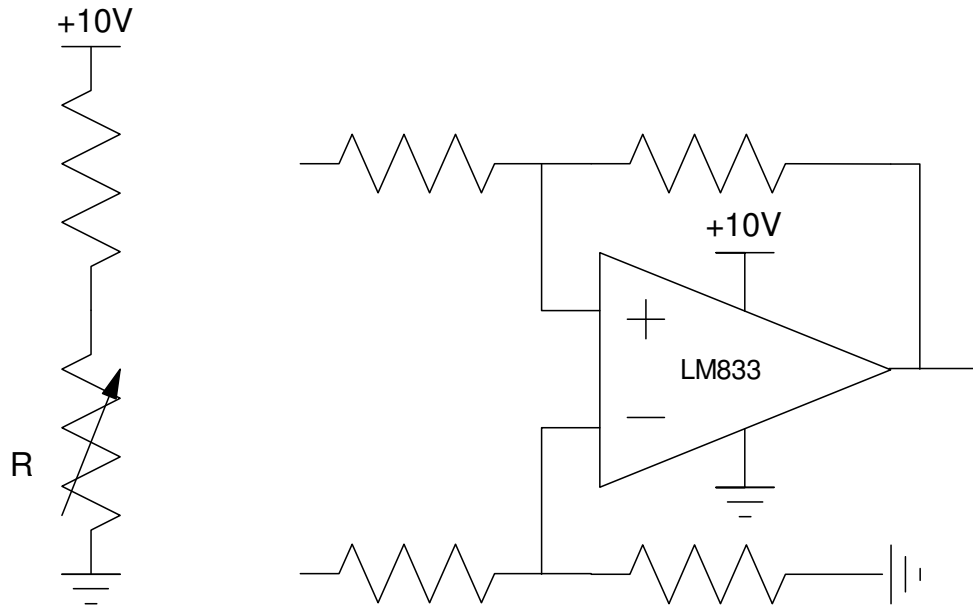- | Vce | = 0.2V when saturated
- β = 100

4) Comparitor: Design a circuit which output

- 0V when R < 1500 Ohms
- 10V when R > 1500 Ohms

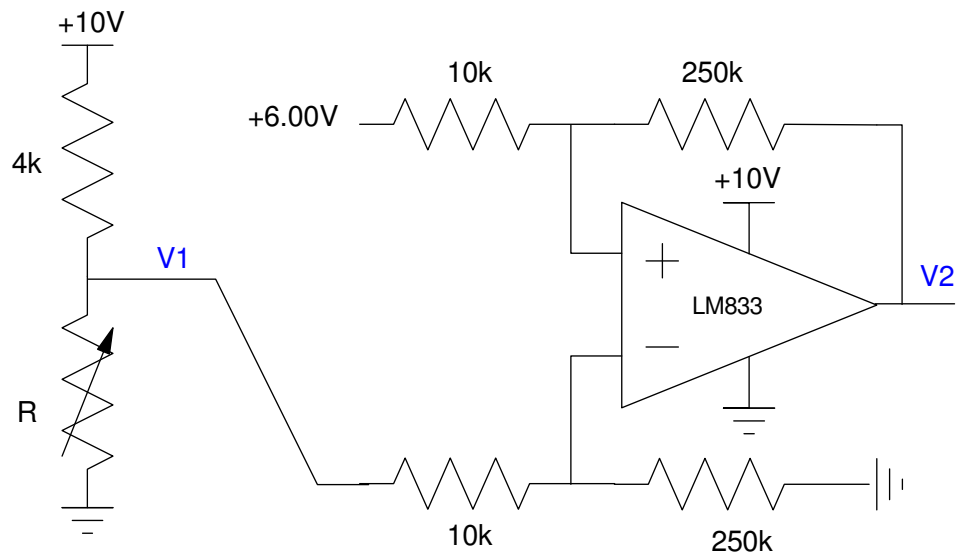5) Schmitt Trigger: Design a circuit which output

- 5V when R > 1500 Ohms
- 0V when R < 1200 Ohms
- No change for 1200 < R < 1500 Ohms

+10V

+10V

LM833

R

6) Schmitt Trigger: Analysis. Determine the voltages and resistance where the following Schmitt trigger turns on and off

On (V2 = +10V)		Off (V2 = 0V)	
V1	R	V1	R

Bonus! Where is the error in the geometric proof that 64 = 65.

- Take an 8x8 square and cut it as shown on the left
- Rearrange it into the rectangle as shown on the right
- The area is now 65 (64 = 65)