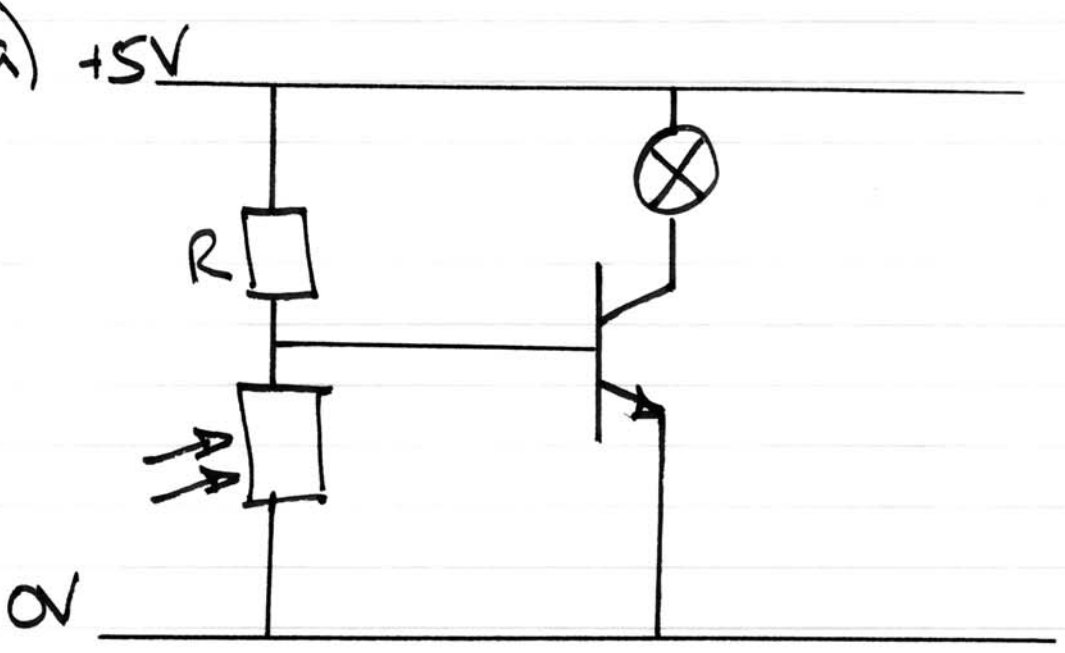
Electronics Homework 3.

1 (a) When the potentiometer is at position Y the LED is off. As the potentiometer moves towards position X, the input voltage at the transistor base increases until the transistor switches on and activates the LED.

(b) The transistor is off at position Y.

(c) When the transistor is fully on, the voltmeter will read <u>0.7V</u>.

2 (a)



this circuit will switch on the light as the room becomes dark.

2. (b) As the light level falls the resistance of the LDR increases. This causes the input voltage at the base of the transistor to rise.

Once the transistor base voltage rises to 0.7V, the transistor switches on and turns on the lamp.

3. If the engine overheats the resistance of the thermistor will fall. The falling resistance at the thermistor causes an increase in voltage across the resistor.

If the voltage across the resistor reaches 0.7V, the transistor will switch on and activate the buzzer.

4. (a) 0V (because the capacitor is fully charged).

(b) The light is off.

(c) 12V (because the capacitor is uncharged).

(d) The light turns on.

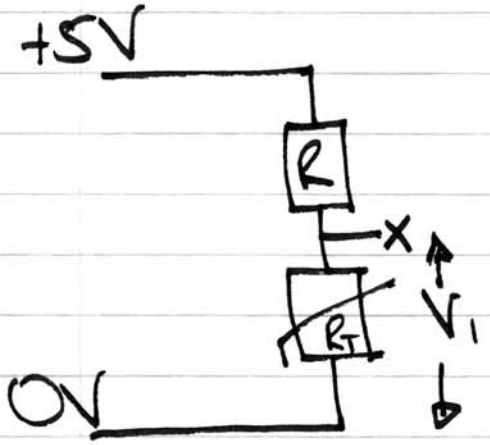
4 (e) When the door is closed again the switch S is opened and the capacitor starts to charge.

As the capacitor charges, the voltage at point X begins to fall.

Eventually, the voltage at point X falls below 0.7V and the transistor switches off, turning off the lamp.

Electronics homework 4.

4. (a) low temperature; $R = 200\Omega$, $R_T = 800\Omega$



$$V_1 = \left(\frac{800}{800+200}\right) \times 5V$$

$$= \left(\frac{800}{1000}\right) \times 5V$$

$$= 0.8 \times 5V$$

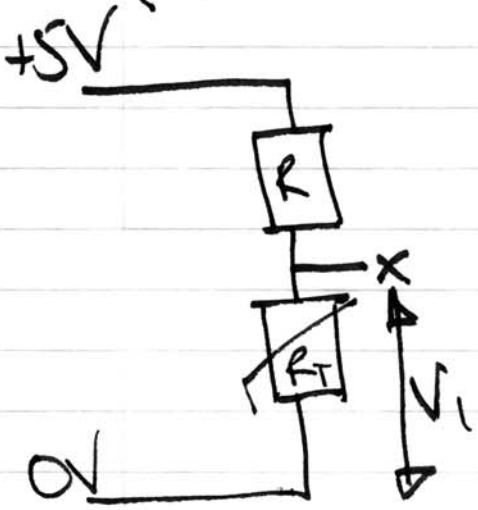
$$\rightarrow V_1 = \underline{4V}$$

(b) This is logic level 1.

(c) The logic at point Y is 0.

(d) The transistor is off.

(e) at critical temperature: $R = 200\Omega$, $R_T = 20\Omega$



$$V_1 = \left(\frac{20}{20+200}\right) \times 5V$$

$$= \left(\frac{20}{220}\right) \times 5V$$

$$= \underline{0.45V}$$

(f) The logic level at point Y is now 1.

(g) When the logic level at point Y changes from level 0 to level 1, the transistor switches on and the motor turns on to open the window.