

((Model Answer))

Name:

Sec:

B.N.:

1. Which type of proximity sensor/sensors is suitable for detecting the following objects and why?

a. Glass objects = transparent, can't use optical proximity sensors. (6 degrees)

b. Objects on the floor in a robot path IR, ultrasonic

c. Objects with different colors

ultrasonic sensors (we can't use optical type because each color reflects different amount of light)

2. What is the problem of using multiple proximity sensors? What are the possible techniques to deal with this problem? (4 degrees)

• interference between sensors signals is possible

• possible techniques to ~~deal with~~ ^{use} when you want to use multiple sensors:

1) allow a time difference between each sensor reading (≈ 50 ms) to let the ping die off.

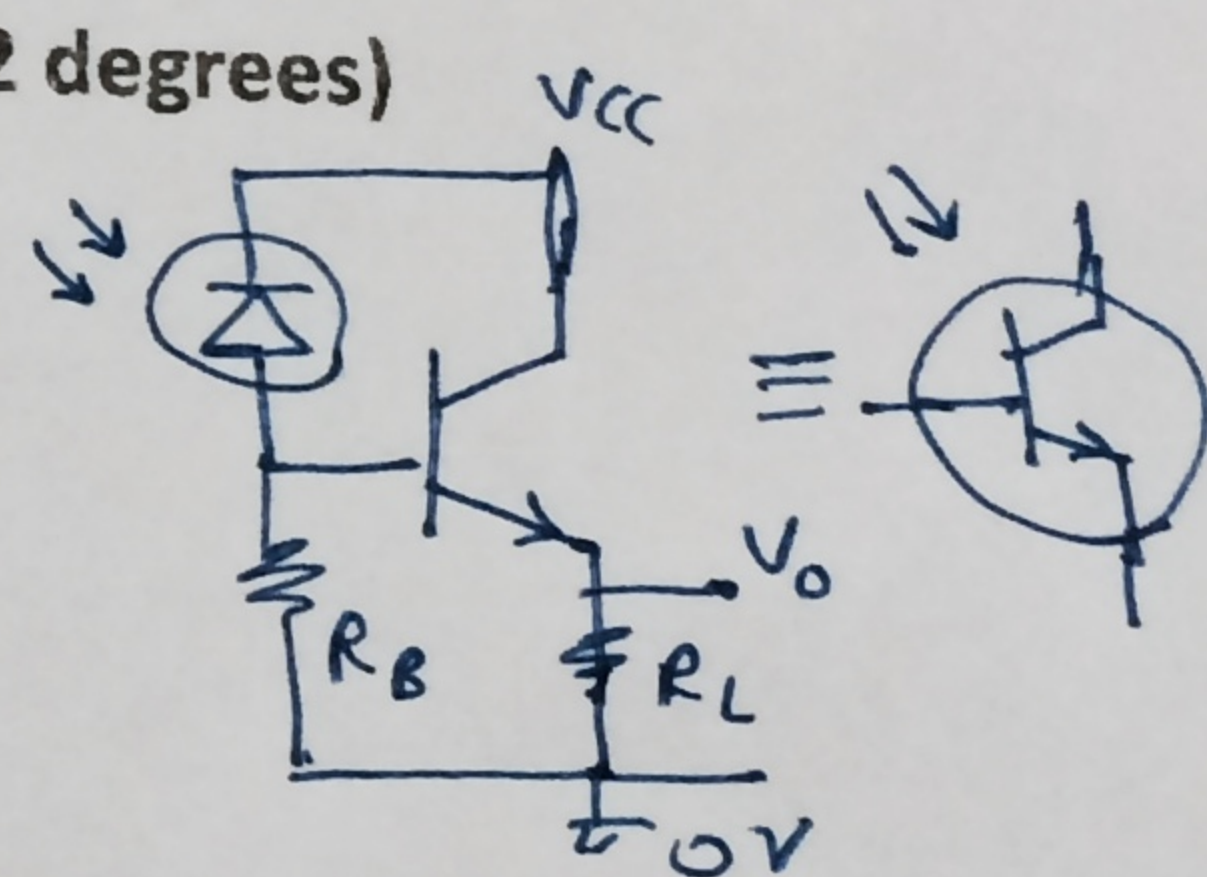
2) use different frequencies

3) adjust sensors directions & spacing to prevent interference of 1Re sensor beam (cone)

3. What is the difference between photo-diode and phot-transistor? (2 degrees)

• photo-transistor = photo diode with amplification

• & can provide current gain & more sensitive than the photo-diode



4. Draw the Bubba oscillator? What type is it? What are the advantages of bubba oscillator design? What is the oscillation frequency? (4 degrees)

5. Wien Bridge Oscillator circuit is required to generate a sinusoidal waveform of 5,200 Hertz. (4 degrees)

I. Calculate the values of the frequency determining resistors R_1 and R_2 and the two capacitors C_1 and C_2 to produce the required frequency.

II. Also, if the oscillator circuit is based around a non-inverting operational amplifier configuration, determine the minimum values for the gain resistors to produce the required oscillations.

↳ question (2) in sheet (1)

⇒ Bubba oscillator

- is a phase-shift type oscillator

- The advantage is the usage of buffer amplifier between each stage and the next one to prevent loading effect & attenuation

- $$f_r = \frac{1}{2\pi RC\sqrt{2N}}$$

$N = 4$ stages for bubb oscillator