

Solution: time for led in ON state = $100 \text{ ms} = 100 \times 10^{-3} \text{ s}$
 " " " " OFF " = $200 \text{ ms} = 200 \times 10^{-3} \text{ s}$

$$T = 0.693 RC$$

(a) let us assume $C = 1 \mu\text{F} = 10^{-6} \text{ F}$

$$t_{\text{ON}} = 0.693 RC$$

$$100 \times 10^{-3} = 0.693 R_3 (10^{-6})$$

$$\frac{100 \times 10^{-3}}{0.693 \times 10^{-6}} = R_3$$

$$R_3 = 144,300.149 \Omega$$

now, $t_{\text{OFF}} = 0.693 R_2 C$

$$200 \times 10^{-3} = 0.693 R_2 (10^{-6})$$

$$\frac{200 \times 10^{-3}}{0.693 \times 10^{-6}} = R_2$$

$$R_2 = 288,600.289 \Omega$$

and we assume $R_1 = R_4 = 1 \text{ k}\Omega$

(b) $F = \frac{1}{T}$ ($T = t_1 + t_2$)

$$= \frac{1}{300} \times 10^{-3}$$

$$= \frac{1000}{300} = 3.3 \text{ Hz} = F$$

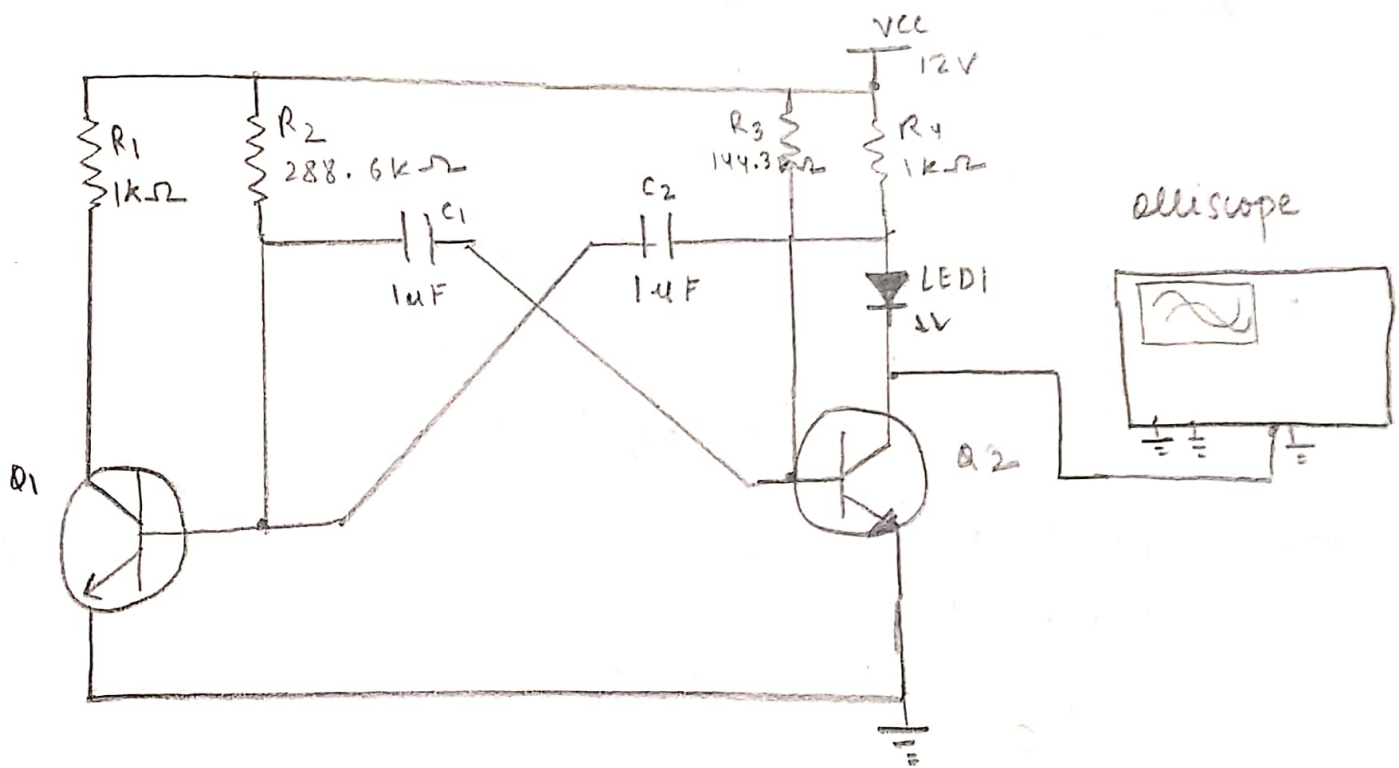
(c) Duty Cycle = $\frac{t_{\text{ON}}}{T(t_1 + t_2)} \times 100$

$$= \frac{100}{300} \times 100$$

$$= 33.33 \%$$

CIRCUIT DIAGRAM :

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