

# GATE 2022 EE

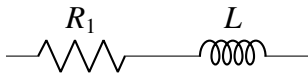
EE23BTECH11023-ABHIGNYA GOGULA

## Question27:

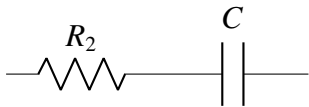
An inductor having a  $Q$ -factor of 60 is connected in series with a capacitor having a  $Q$ -factor of 240. The overall  $Q$ -factor of the circuit is \_\_\_\_\_. (Round off to the nearest integer)

Gate 2022 EE Question 27

SOLUTION



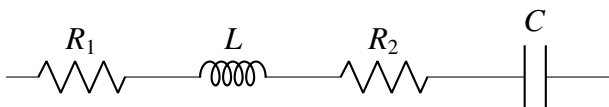
$$Q_1 = \frac{\omega_0 L}{R_1} \quad (1)$$



$$Q_2 = \frac{1}{\omega_0 C R_2} \quad (2)$$

at resonance as  $\omega_0 L = \frac{1}{\omega_0 C}$  hence

$$Q_2 = \frac{\omega_0 L}{R_2} \quad (3)$$



$$Q = \frac{\omega_0 L}{R_1 + R_2} \quad (4)$$

$$Q = \frac{1}{\frac{R_1}{\omega_0 L} + \frac{R_2}{\omega_0 L}} \quad (5)$$

$$Q = \frac{Q_1 Q_2}{Q_1 + Q_2} \quad (6)$$

then from (6)

$$Q = \frac{60 \times 240}{60 + 240} \quad (7)$$

$$Q = 48 \quad (8)$$