

PROB: The bandwidth, β , for an *RLC* filter is the difference of cutoff frequencies, ω_{C1} and ω_{C2} :

$$\text{bandwidth} \equiv \beta \equiv \omega_{c2} - \omega_{c1}$$

where the cutoff frequencies satisfy the following equation (obtained by setting the filter gain equal to $1/\sqrt{2}$).

$$\frac{1}{R} \left(\omega L - \frac{1}{\omega C} \right) = \pm 1$$

The following information is given:

$$\beta = \text{_____} \text{ (bandwidth in Hz supplied by instructor)}$$

$$\omega = 2\pi f \text{ (to convert frequency in Hz to rad/s)}$$

$$L = 0.1 \text{ H}$$

Find the value of R for the given bandwidth.

$$R = \text{_____}$$

Hints: Convert the equation satisfied by the cutoff frequencies into a quadratic equation. (Because of the ± 1 , there are actually two quadratic equations.) Use only the positive roots of the quadratic equations (since cutoff frequencies should be positive). ω_{C2} is the larger of the positive roots, and ω_{C1} is the smaller of the positive roots. Remember also to convert the bandwidth in Hz to bandwidth in rad/s when finding the value of C . Curiously, the value of C will be absent from your final equation for R .