

The carrier frequency of a transmitter is provided by a tank circuit of a coil of inductance $49\mu H$ and a capacitance of $2.5nF$. It is modulated by an audio signal of $12kHz$. The frequency range occupied by the side bands is:

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- $18kHz - 30kHz$
- $63kHz - 75kHz$
- $442kHz - 466kHz$
- $13482kHz - 13494kHz$

Given : Inductance, $L = 49\mu H = 49 \times 10^{-6} H$

capacitance $C = 2.5nF = 2.5 \times 10^{-9} F$

Using $\omega = \frac{1}{\sqrt{LC}}$

$$= \frac{1}{\sqrt{49 \times 10^{-6} \times \frac{2.5}{10} \times 10^{-9}}} = \frac{1}{7 \times 5 \times 10^{-8}} = \frac{10^8}{7 \times 5}$$

$$\text{or, } \frac{10^8}{7 \times 5} = 2\pi \times f = 2 \times \frac{22}{7} \times f \quad (\because \omega = 2\pi f)$$

$$\text{or, } f = \frac{10^7}{22} = \frac{10^4}{22} \text{kHz} = 454.54 \text{kHz}$$

Therefore frequency range $454.54 \pm 12 \text{kHz}$

i.e. $442 \text{kHz} - 466 \text{kHz}$