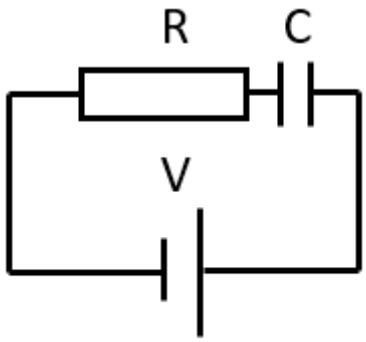
Jules' Workshop

Standard

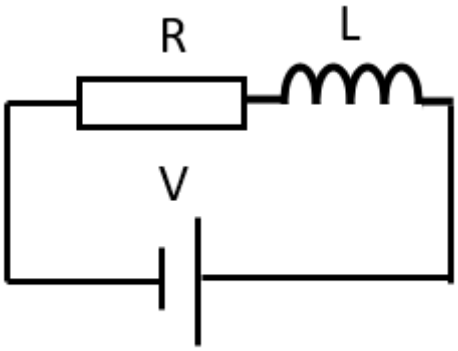
Unit 8 – Answers



Series RC circuit

Q1 Complete the following table in relation to the diagram above.

R	C	Time Constant
10 MΩ	10 mF	**10 kSec**
10 Ω	2 F	**20 Sec**
5 kΩ	**0.6 mF**	3 second



Series RL circuit

Q2 Complete the following table in relation to the diagram above.

R	L	Time Constant
10 MΩ	10 mH	**1 nSec**
10 kΩ	2 H	**0.2 mSec**
5 kΩ	**15 kH**	3 second

Q3 What is resistance, reactance and impedance with regards to a tuned circuit? Explain their relationship.

Reactance resists current without dissipating power, unlike resistors. Inductive reactance increases with frequency and inductance. Capacitive reactance decreases with frequency and capacitance. Impedance represents total opposition provided by reactance and resistance.

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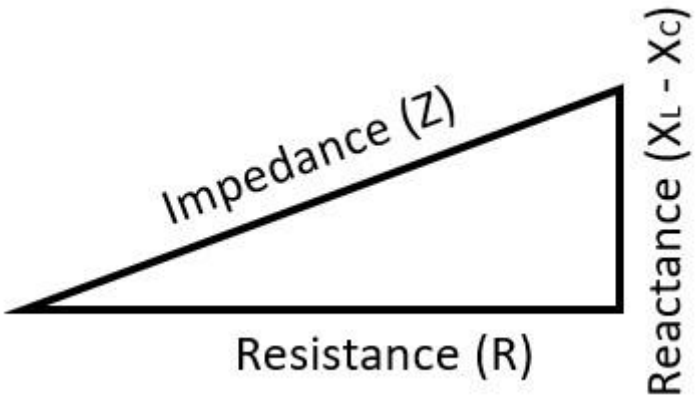

Q4 What is the reactance of the following components at the allocated frequencies?

Capacitor	Frequency	Reactance
2 uF	1 MHz	**0.079 Ω**
1 F	1 Hz	**0.159 Ω**
1 F	100 MHz	**1.59 Ω**
5.68 F	28 MHz	10 Ω
3 pF	**5.306 Hz**	10 Ω

Q5 What is the reactance of the following components at the allocated frequencies?

Inductor	Frequency	Reactance
2 uH	1 MHz	**12.5 Ω**
1 H	1 Hz	**6.282 Ω**
1 H	100 MHz	**6.282 MΩ**
1.6 GH	28 MHz	10 Ω
3 H	**188 Hz**	10 Ω

Q6 At what frequency would the following tuned circuits be resonant?

Capacitor	Inductor	Frequency
3 pF	3 uH	**53 MHz**
1 F	1 H	**0.0159 Hz**
1 uF	1 uH	**159 Hz**
1 uF	**0.129 nH**	14 MHz

Q7 What is the reactance of a series tuned circuit at frequency?

A. Low
B. High
C. Changes
D. Does not resonate.

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Q8 What is the reactance of a parallel tuned circuit at frequency?

A. Low
B. High
C. Changes
D. Does not resonate.

Q9 What is the reactance of a parallel tuned circuit at any frequency outside of resonance?

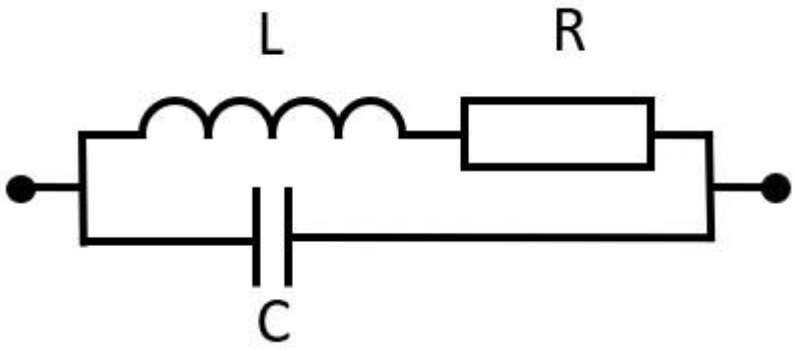
A. Low
B. High
C. Changes
D. Does not resonate.

Q10 What is the reactance of a series tuned circuit at any frequency outside of resonance?

A. Low
B. High
C. Changes
D. Does not resonate.

Q11. Draw a series LCR tuned circuit.

Q12 Draw a parallel LCR tuned circuit.



Q13 What is the Q of a tuned circuit?

The ratio of the reactance to the resistance, in an operational circuit, is called the Q (Quality Factor) of the circuit. If the current in the circuit is plotted against frequency, either side of the resonant frequency, the result will be a Q plot resembling a bell curve. The base of the bell and the height of the bell indicate the bandwidth of the circuit.

A sample Q plot of a series tuned circuit is shown in Figure 6. As the frequency drops, the capacitive reactance X_C is predominant while the inductive reactance X_L is predominant in the higher frequencies.

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Q14 Complete the following table for a series tuned circuit.

Reactance	Resistance	Q
10 Ω	1 Ω	**10**
10 Ω	100 Ω	**0.1**
10 Ω	**10 Ω**	10

Q15 Complete the following table for a parallel tuned circuit.

Reactance	Resistance	Q
10 Ω	1 Ω	**0.1**
10 Ω	100 Ω	**10**
10 Ω	**100 Ω**	10

Q16 Complete the following table for the bandwidth of tuned circuits.

Q	Resonant Frequency	BW
10	20 MHz	**2 MHz**
35	20 MHz	**57 Hz**
0.005	20 MHz	10 kHz

Q17 What is a filter and why are they used?

Electronic filters remove unwanted frequency components from the applied signal, enhance wanted ones or both.

Q18 Describe the four basic filter configurations.

Low pass, high pass, band pass and band stop.

Q19 Draw a choke and describe what it is used for?

A choke is a low pass filter that removes transient spikes on signal lines.

Q20 What type of filter is a choke?

Low pass filter

Q21 Describe where the cutoff point is for a filter.

When the signal is attenuated to the 3dB point of half power point.

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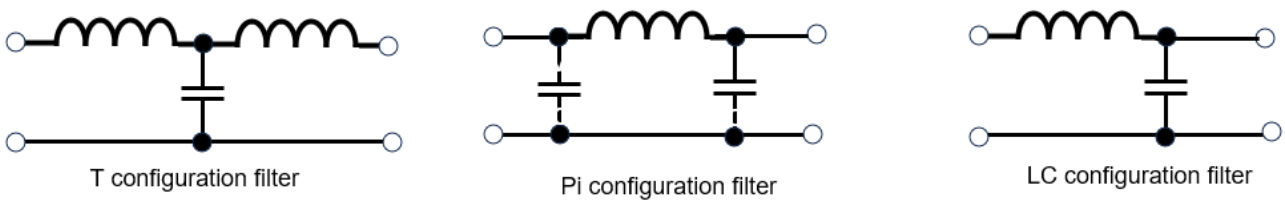
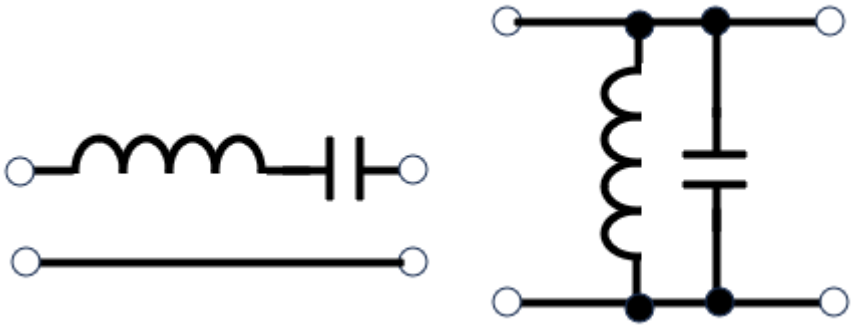
Q22 What is a “T” and “π” configuration filter?

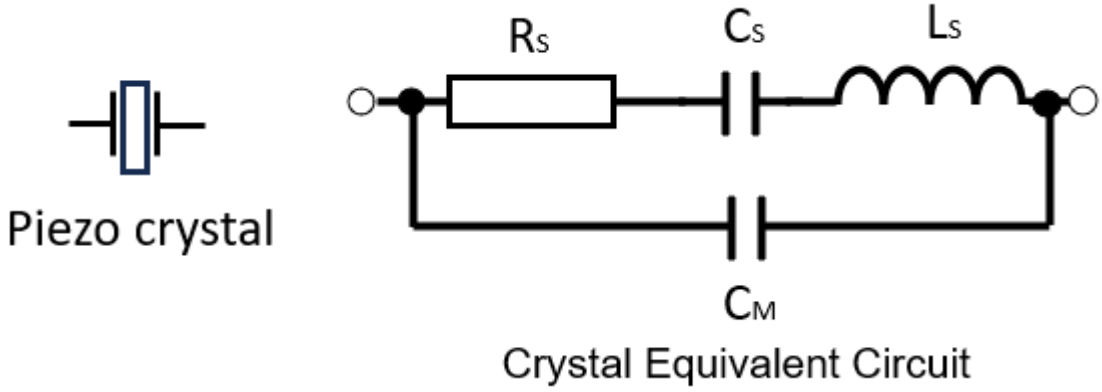


Q23 What is the characteristic of the filters shown below?



Band pass filter. The series circuit only allows resonant frequencies to pass. The parallel circuit drops all but resonant frequencies.

Q24 Draw the equivalent circuit for a piezo crystal and explain the parts.



The above equivalent circuit consists of a series R_S-C_S-L_S circuit in parallel with a capacitance C_M. When the crystal mounted across the AC source is not vibrating, it is equivalent to the capacitance C_M. However, when the crystal vibrates, it acts like a tuned series R-L-C circuit.

Q25 Do a google search and read about the Butterworth and Chebyshev filters.

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