Question: 1. With the aid of a circuit diagram, describe the three ammeter...

1. With the aid of a circuit diagram, describe the three ammeter method for measuring an active power in an electrical circuit. 2. Derive an expression for the active power using the three measurements 3. Derive an expression for the Q-factor for the unknown inductance.
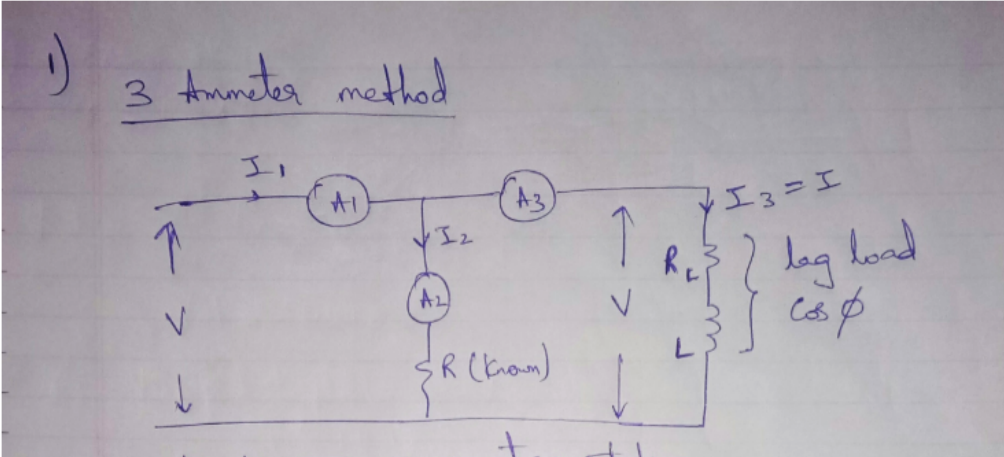
Expert Answer ⓘ

Akhil Reddy answered this
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1)

3 Ammeter method

Active power $P = V I_3 \cos\phi = (I_2 R) I_3 \cos\phi$

$$= I_2 I_3 \frac{(I_1^2 - I_2^2 - I_3^2)}{2 I_2 I_3} R$$

$$\boxed{P = \frac{(I_1^2 - I_2^2 - I_3^2)}{2} R \; / watts}$$

3) $Q factor = \frac{\omega L}{R_L} = \tan\phi = \frac{\sin\phi}{\cos\phi} = \frac{\sqrt{1-\cos^2\phi}}{\cos\phi}$

Using $\cos\phi$ value in this we get

$$Q factor = \frac{\sqrt{1 - \left(\frac{I_1^2 - I_2^2 - I_3^2}{2 I_2 I_3}\right)^2}}{\frac{I_1^2 - I_2^2 - I_3^2}{2 I_2 I_3}} = \frac{\sqrt{4 I_2^2 I_3^2 - (I_1^2 - I_2^2 - I_3^2)^2}}{I_1^2 - I_2^2 - I_3^2}$$

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