Paper 1, TDC Part-1
Chapter– 1, Introduction to Passive Elements
Lecture - 2

By:

Mayank Mausam

Assistant Professor (Guest Faculty)

Department of Electronics

L.S. College, BRA Bihar University,

Muzaffarpur, Bihar

Introduction to Passive Elements

- The value of R can range from '0' to '∞'

If R = 0Ω this means a short circuit. then Voltage (V) for short circuit is,

$$V = iR = 0$$

The short circuit voltage across an element is 'zero'.

Circuit representation of short circuit.

- If R = ∞Ω, this means an open circ

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For open circuit,

$$i = \lim_{R \to \infty} \frac{V}{R} = 0$$

So for an open ckt, the current will be "zero".

In circuit analysis some time we deal with reciprocal of resistance 'R', known as conductance 'G'.

It is defined as a measure of how well a element can conduct electric current.

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The unit of conductance is siemens (S) or mho (℧)

$$G = \frac{1}{R} = \frac{I}{V}$$

Unit of conductance is siemen (S) or mho (℧)

$$1\,S = 1\,℧ = 1\,A/1\,V$$

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The same resistance can be expressed ~~or~~ in terms of ohms or siemens.

For example, 10Ω is same as $0.1\ \mho = \frac{1}{10}\ \mho$

Power dissipated in resistor in terms of conductance can be given as,

$$P = VI = V \times VG = V^2 G = \frac{I^2}{G}$$

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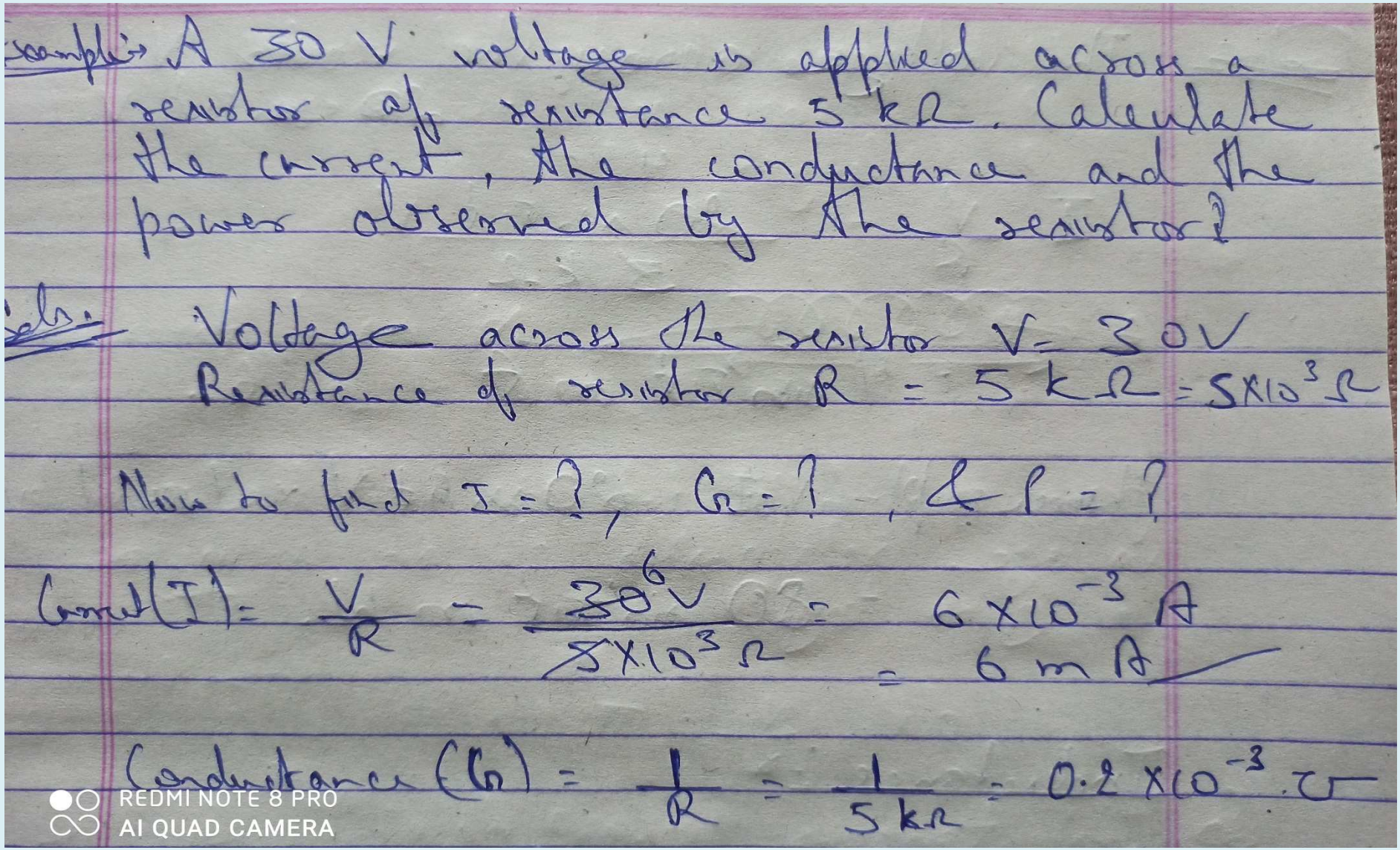

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Conductance $(G) = \frac{1}{R} = \frac{1}{5\,k\Omega} = 0.2 \times 10^{-3}\ \mho$

$= 0.2\ m\mho = 0.2\ mS$

$P = \frac{V^2}{R} = \frac{(30)^2}{5 \times 10^{+3}}$ Watt

$= \frac{900}{5 \times 1000} = 1.8 \times 10^{-1}$ Watt

$= 0.18\ W$

Example:- A voltage source of 20 sin ωt V voltage is applied across a resistor of resistance 5 kΩ. Calculate the current through the resistor and the power absorbed by the circuit.

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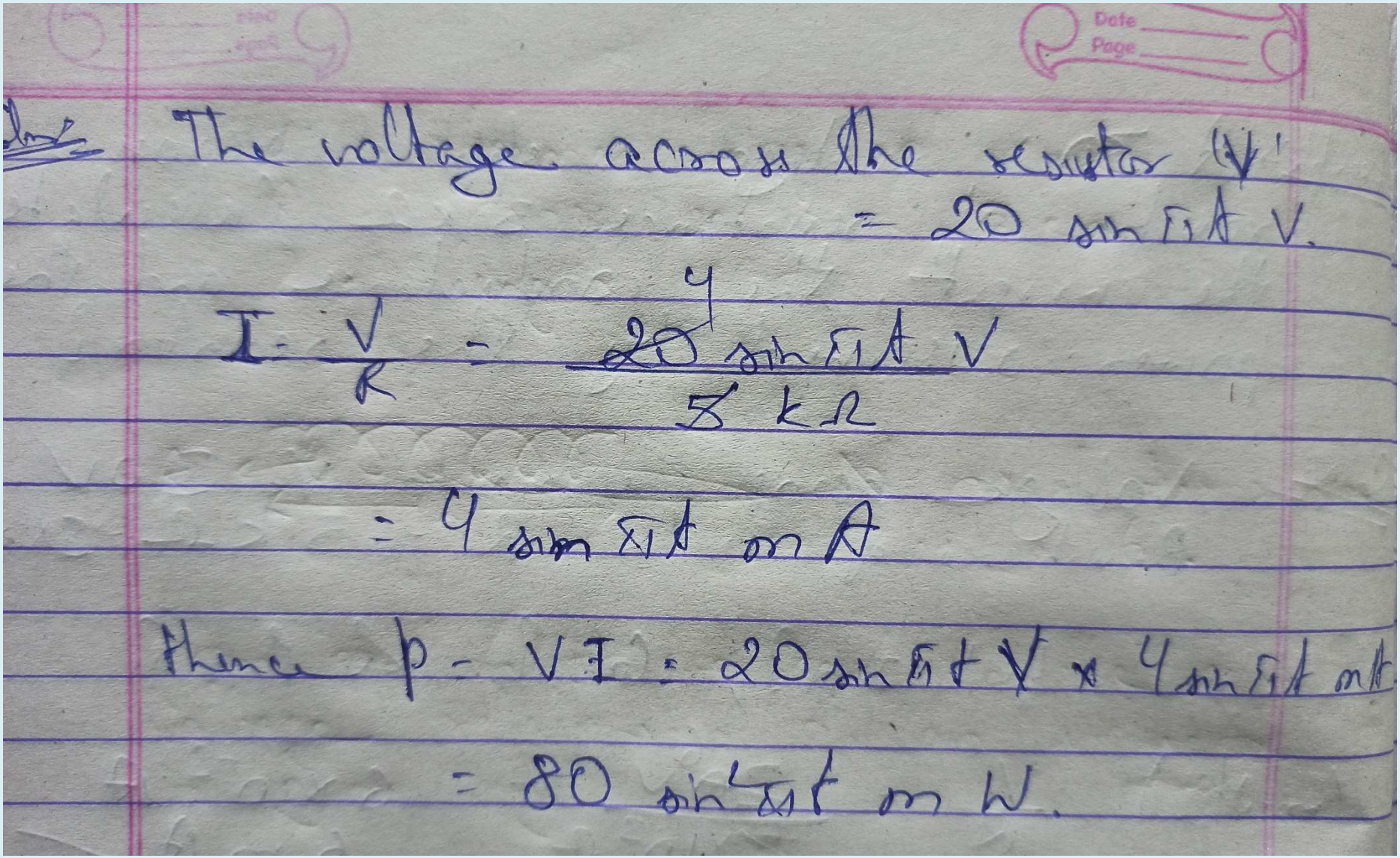

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across the inductor is directly proportional to the time rate of change of the current. as,

$$V \propto \frac{di}{dt}$$

or, $$V = L\frac{di}{dt} \qquad \text{(i)}$$

where 'L' is the constant of proportionality and is known as the inductance of the inductor.

So inductance is the property whereby an inductor exhibits opposition to the change of current flowing through it. It is measured in Henry (H).

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1 henery = 1 volt-second/ampere.

Inductance of an inductor depends on →

- its physical dimensions → length & cross-sectional area.
- construction → no. of turns.

for a solenoid shaped inductor, inductance (L) is given as,

$$L = \frac{N^2 \mu A}{l}$$

where, N = number of turns.

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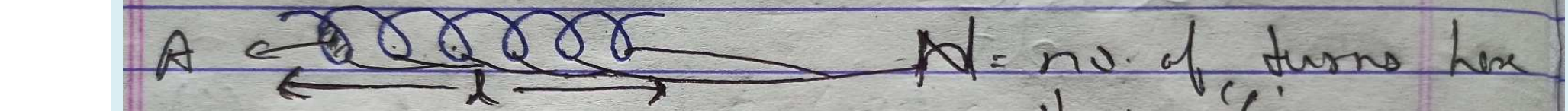
μ = permeability of core
A = cross-sectional area
l = length



N = no. of turns here it is '6'.

from equation (i) we can find the current-voltage relationship of an inductor, and is given by.

$$di = \frac{v}{L}\,dt$$

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For any query contact- 9771474020

Thank You