

An Autonomous Institution
Coimbatore-35

Department of ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

23EET103-Electric Circuits and Electron Devices
I B.Tech. CSE-IOT/ II SEMESTER



UNIT II : AC CIRCUITS

Topic : Problems with step by step solutions

AC FUNDAMENTALS – PROBLEM 1

A sinusoidal waveform has a period of 0.02 s.

Find the frequency.

Solution:

Given: $T = 0.02$ s

Formula: $f = 1 / T$

$$f = 1 / 0.02$$

$$f = 50 \text{ Hz}$$

AC FUNDAMENTALS – PROBLEM 2

An AC supply has frequency 60 Hz.

Find the time period.

Solution:

Given: $f = 60$ Hz

Formula: $T = 1 / f$

$$T = 1 / 60$$

$$T = 0.0167 \text{ s}$$

RMS VALUE — PROBLEM

Peak voltage of an AC waveform is 325 V.

Find the RMS voltage.

Solution:

Formula: $V_{rms} = V_m / \sqrt{2}$

$$V_m = 325 \text{ V}$$

$$V_{rms} = 325 / 1.414$$

$$V_{rms} \approx 230 \text{ V}$$

INDUCTIVE CIRCUIT – PROBLEM

An inductor of 0.2 H is connected to a 50 Hz supply.

Find inductive reactance.

Solution:

Formula: $X_L = 2\pi fL$

$$X_L = 2 \times 3.14 \times 50 \times 0.2$$

$$X_L = 62.8 \Omega$$

CAPACITIVE CIRCUIT – PROBLEM

A capacitor of $100 \mu\text{F}$ is connected to 50 Hz supply.

Find capacitive reactance.

Solution:

Formula: $X_C = 1 / (2\pi fC)$

$C = 100 \mu\text{F} = 100 \times 10^{-6} \text{ F}$

$X_C \approx 31.8 \Omega$

IMPEDANCE – PROBLEM

A circuit has $R = 10 \Omega$ and $X_L = 20 \Omega$.

Find the impedance.

Solution:

$$\text{Formula: } Z = \sqrt{R^2 + X_L^2}$$

$$Z = \sqrt{10^2 + 20^2}$$

$$Z = \sqrt{500}$$

$$Z \approx 22.36 \Omega$$

POWER IN AC CIRCUIT – PROBLEM

Voltage = 230 V, Current = 5 A, Power factor = 0.8.

Find real power.

Solution:

Formula: $P = VI \cos\phi$

$$P = 230 \times 5 \times 0.8$$

$$P = 920 \text{ W}$$

POWER FACTOR – PROBLEM

Real power = 800 W

Apparent power = 1000 VA

Find power factor.

Solution:

Formula: $PF = P / S$

$PF = 800 / 1000$

$PF = 0.8$

THREE PHASE CIRCUIT – PROBLEM

Line voltage = 400 V

Line current = 10 A

Power factor = 0.9

Find three-phase power.

Solution:

Formula: $P = \sqrt{3} V_L I_L \cos\phi$

$$P = 1.732 \times 400 \times 10 \times 0.9$$

$$P \approx 6235 \text{ W}$$

Thank
you!