Date: _____ Day: M T W T F

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CMS-ID 023-23-0165.

Subject Applied Physics

Assignment # 01

Date: 17-05-2024.

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Q No #01 Define Electrodynamics. List down the different sources of magnetic field? Write down the importance of electrodynamics in daily life.

Ans: **Electrodynamics:-**

Electrodynamics is the branch of physics that studies the interactions between electric charges and currents via electric and magnetic field.

Sources of Magnetic Field.

(1) Moving electric charges
(2) Electric current.
(3) Permanent Magnets
(4) Changing Electric Fields
(5) Electromagnetic waves.

Importance of Electrodynamics in Daily life.

(1) Electric Power Generation and Distribution: Enables the generation and transmission of electricity to power homes and industries.

(2) Electronic Devices: Essential for the operation of gadgets like smartphones, computers, and televisions.

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(3) Communication Systems: Underpins wireless communication technologies such as radio, mobile phones, and Wi-Fi.

(4) Medical Technology: Powers diagnostic tools like MRI and X-ray machines for medical imaging.

(5) Transportation: Drives electric motors and generators used in electric vehicles and trains.

QNo # 02. What do you know about Faraday's Law of electrodynamic Induction? Describe the two laws of Faraday.

Ans:

Faraday's Law of electromagnetic Induction:

Faraday's law of electromagnetic Induction states that a change in the magnetic environment of a coil of wire will induce an electromotive force (EMF) in the coil.

(1) First Law of Faraday: An EMF is induced in a conductor when there is a change in the magnetic flux linking the conductor.

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(2) 2nd Law of Faraday:

The magnitude of the induced EMF is directly proportional to the rate of change of the magnetic flux through the coil.

Mathematically:

$$EMF = -N \frac{d\Phi_B}{dt}$$

Q No # 03. Differenciate between the Lenz's law and Faraday's law of electro-magnetic Induction.

Faraday's Law	Lenz's law.
(1) Faraday's law tells us how much EMF is induced.	(1) Lenz's law tells us the direction of this induced EMF.
(2) Focuses on the magnitude of the induced EMF	(2) Focuses on the direction of the induced EMF and provides negative sign in Faraday's law equation.
(3) Quantifies the induced EMF due to changing magnetic flux. $\mathcal{E} = -\frac{d\Phi_B}{dt}$	(3) Emphasizes that the induced EMF opposes the change in magnetic flux.

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Q No #04. (a). Define Clipper Circuit. List down and describe the types of clipper circuits.

Ans:

Clipper Circuit: A clipper circuit is an electronic circuit designed to prevent the output voltage from exceeding predetermined value without distorting the remaining part of the input signal.

For example: Half wave rectification.

Types of Clipper Circuit.

(1) Series Positive clippers :- The clippers which clip the positive half-cycle of the input signal. They limit the maximum positive voltage to the reference level.

(2) Series Negative Clippers: The clippers which clip the negative half-cycle of the input signal and they limit the maximum negative voltage to the reference level.

More types of Clipper Circuits

(1) Series Positive Clippers with positive Bias
(2) Series Negative Clippers with positive Bias
(3) Series Positive Clippers with Negative Bias
(4) Series Negative Clippers with Negative Bias.
(5) Shunt positive Clippers.
(6) Shunt negative Clippers
(7) Shunt negative clippers with negative Bias.

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(8) Shunt negative clippers with positive Bias
(9) Shunt positive clippers with positive Bias
(10) Shunt positive clippers with negative Bias

Q No: #04. (b) What is the effect of changing the Bias voltage in a clipper Circuit.

Ans: Changing the Bias Voltage in a clipper circuit shifts the clipping level. Here's how it effects the circuit!

(1) Increasing Bias Voltage: Raises the threshold at which clipping occurs, allowing a higher portion of the input signal to pass through before being clipped

(2) Decreasing Bias Voltage: Lowers the threshold at which clipping occurs, causing more of the input signal to be clipped at a lower voltage level

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QNo#05. A half wave rectifier is used to supply 10V D.C. to a resistor load of 100 Ω. The diode has a resistance of 50 ohm. Calculate AC voltage required.

Sol. Data: $V_{DC} = 10V$

$R_L = 100\ \Omega$

$R_D = 50\ \Omega$

$R_T = 100 + 50$

$$R_T = 150\ \Omega$$

using Ohm's law.

$V = IR$

$V_{DC} = I_{DC} R$

$$I_{DC} = \frac{V_{DC}}{R_L}$$

$$= \frac{10}{100}$$

$$I_{DC} = 0.1\ A$$

Since

$$I_{DC} = \frac{I_{peak}}{\pi}$$

$$I_{peak} = I_{DC} \times \pi$$

$$I_{peak} = 0.1\pi\ A$$

$$V_{peak} = \frac{I_{peak}}{R_T} \qquad I_{peak} \times R_T$$

$$= \frac{0.1\pi}{150} \qquad 0.1\pi \times 150$$

$$V_{peak} = 47.1$$

Now finally

$$V_{ac} = V_{rms} = \frac{V_{peak}}{\sqrt{2}} = \frac{47.1}{\sqrt{2}} = 33.3V$$

The End.