Physics Notes for Class 12 chapter 8 and 15 ELECTROMAGNETIC WAVES and COMMUNICATIONOMMUNICATION SYSTEMSYSTEMS

Displacement Current

It is a current which produces in the region in which the electric field and hence the electric flux changes with time.

Displacement current, $I_D = \varepsilon_o \cdot d\phi_E / dt$

where, ϕ_E is the electric flux.

Ampere-Maxwell Law

$$\oint \mathbf{B} \cdot d\mathbf{l} = \mu_0 (I + I_D)$$
where, μ_0 = Permeability
= $4\pi * 10^{-7} \text{ V / Am}$
Maxwell's Fourt ON IEN from 1 of 13
(i) $\oint_S \mathbf{E} \cdot d\mathbf{S} = \frac{q}{\varepsilon_0}$

This equation is Gauss's law in electrostatics.

(ii) $\oint_{S} \mathbf{E} \cdot d\mathbf{S} = 0$

This equation is Gauss's law in magnetostatics.

(iii) $\oint_{S} \mathbf{E} \cdot d\mathbf{l} = -\frac{d}{dt} \oint_{S} \mathbf{B} \cdot d\mathbf{S}$

This equation is Faraday's law of electromagnetic induction.

(iv)
$$\oint \mathbf{B} \cdot d\mathbf{l} = \mu_0 \left(I + \varepsilon_0 \frac{d\phi_E}{dt} \right)$$

This equation is Ampere-Maxwell law.

In the process of modulation anyone characteristic of carrier wave is varied in accordance with the instantaneous value of audio signal (modulating signal).

Need of Modulation

(i) Energy carried by low frequency audio waves (20 Hz to 20000 Hz) is very small.

(ii) For efficient radiation and reception of signal. the transmitting and receiving antennas should be very high approximately 5000 m.

(iii) The frequency range of audio signal is so small that overlapping of signals create a confusion.

Types of Modulation

(i) Amplitude Modulation In this type of modulation, the amplitude of high frequency carrier wave is varied in accordance to instantaneous amplitude of modulating signal.

Band width required for amplitude modulation

= twice the frequency of the modulating signal.

co.uk of high frequency carrier (ii) Frequency Modulation In this type of modulation, the free? wave is varied in accordance to instantaneous frequencies modulating signal.

(iii) Pulse Modulation In this type of ulation, the continuous waveforms are sampled at regular intervals. Informa entit transmitte mly at the sampling times.

Demodulatio

The process of separating of audio signal from modulated signal is called demodulation.

Antenna

An antenna converts electrical energy into electromagnetic waves at transmitting end and pick up transmitted signal at receiving end and converts electromagnetic waves into electrical signal.

Modem

The term modem is contraction of the term modulator and demodulator. Modem is a device which can modulate as well as demodulate the signal. It connect one computer to another through ordinary telephone lines.

Fax (Facsimile Telegraphy)