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CLASSMATE

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SEM - IV Unit - 1 paper - 06.

⇒ Electromagnetic wave Derivation :-

Take curl of Faraday's law :-

$$\nabla \times (\nabla \times \vec{E}) = -\frac{\partial}{\partial t} (\nabla \times \vec{B})$$

Using vector identity :-

$$\nabla (\nabla \cdot \vec{E}) - \nabla^2 \vec{E}$$

in free space

$$\nabla \cdot \vec{E} = 0$$

So, we get

$$\boxed{\nabla^2 \vec{E} = \mu_0 \epsilon_0 \frac{\partial^2 \vec{E}}{\partial t^2}}$$

This is wave equation.

Speed of wave :-

$$c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$$

Which is equals to speed of light

Maxwell predicted that light is an electromagnetic wave.

Q Important Question :- (Home work).

- ① Derive electromagnetic wave equation from Maxwell's equation (in free space).
- ② What is electromagnetic momentum density?
- ③ State and explain Lorentz force.