Y-2012

SUBJECT CODE NO: Y-2012
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc (PATTERN-2013) (T.Y SEM V)
Examination April / May - 2024
Physics Paper- XVI (Electrodynamics)

[Time: 1:30 Hours]                                                           [Max. Marks:50]

Please check whether you have got the right question paper.

N. B              1) All questions are compulsory.
                  2) Use of logarithmic table and electronic pocket calculator is allowed.

**Q.1** A) Derive an expression for divergence of $\vec{E}$ and curl of $\vec{E}$.                     10

B) What is Maxwell's displacement current? Derive the Equation of modified form of       10

Ampere's law. $\vec{\nabla} \times \vec{H} = \vec{J} + \frac{\partial \vec{v}}{\partial t}$

**OR**

A) Obtain an electromagnetic wave Equation of electric field $\vec{E}$ and magnetic field $\vec{B}$ in   10

The conducting medium.

B) Derive an Equation for boundary condition of $\vec{E}$ and $\vec{D}$ ' at the interface between the   10

Two media.

**Q.2** A) Derive the Poisson's equation.                                                              05

B) If electric field is given by $\overrightarrow{5\iota} + \overrightarrow{4j} + \overrightarrow{9k}$ unit. Calculate the electric flux       05

Through surface area 100 units lying in X-Y plane.

C) Explain the transverse nature of electromagnetic wave.                                              05

D) Calculate the value of Poynting vector on the surface of the sun if the power radiated       05
by it is $3.8 \times 10^{26}$ watt. (radius of sun $= 7 \times 10^8$m) If the average surface between the
sun & the earth is $1.5 \times 10^{11}$m, show that the value of Solar Constant is $1.34 \times 10^3$
watt/m$^2$

**OR**

A) Explain the phenomenon of self-induction and mutual induction.                                    05

B) If current in a 130m H coil changes steadily from 20 mA to 28 mA in 140 ms. Find       05
the magnitude and direction of induced emf.

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C) Prove that Bin = B₂n for the field vector $\vec{B}$ at the interface between the two media.  05

D) A beam of flash light travelling in air medium on the surface of thin glass at an angle  05
of 38° with normal. The refractive index of glass is 1.56, What is the angle of
Refraction.

## Q.3 Multiple choice questions.  10

1) Gauss law in integral form is

A) $\vec{\nabla} \cdot \vec{E} = q / \epsilon_0$   B) $\oint \vec{E} \cdot \vec{da} = \frac{Qend}{\epsilon_0}$   C) both a & b   D) None of these.

2) Maxwell's displacement current density is

A) $\vec{J} + \frac{\overline{\partial D}}{\partial T}$   B) $\frac{\overline{\partial D}}{\partial T}$   C) $\vec{\nabla} \cdot \vec{D}$   D) None of these

3) Energy of Electromagnetic waves is divided equally into ------ field vectors.

A) Electric   B) Magnetic   C) Both a & b   D) None of these.

4)........Component of magnetic field $\vec{B}$ is continuous across the boundary.

A) Tangential   B) Normal   C) Vertical   D) Parallel.

5)According to Gauss law, the flux through any surface enclosing the charge is

A) $q/\epsilon_0$   B) $q_0 \epsilon_0$
C) $q_0 \epsilon_0$   D) None of these

6) Differential form of faraday's law is

A) $\vec{\nabla} \times \vec{E} = -\frac{\partial B}{\partial t}$   B) $\vec{\nabla} \times \vec{E} = -\frac{\partial B}{\partial t}$   C) $\vec{\nabla} \times \vec{E} = \frac{\partial^2 B}{\partial t2}$   D) None of these

7) The rate of energy flow per unit area is

A) $\vec{E} \times \vec{B}$   B) $\vec{E} \times \vec{H}$   C) $\vec{E} \times \vec{D}$   D) $\vec{D} \times \vec{H}$

8) n₁ $\sin\theta_1$ = n₂ $\sin\theta_2$ represents of refraction.

A) Brewster's law   B) Snell's law   C) Momentum law   D)None of these.

9)In Electromagnetic waves, the phase difference between Electric field Vector

& magnetic field vector is

A) Zero      B) $\pi/2$      C) $\pi$      D)$\pi/3$

10) Equation of continuity represents the conservation of

A) Energy     B)Time     C) Charge     D) None of these