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Code No. : 7562   **Sub. Code : KPHM 32/**
PPHM 32

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2019.

Third Semester

Physics

ELECTROMAGNETIC THEORY

(For those who joined in July 2016 and afterwards)

Time : Three hours   Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Laplace equation $\nabla^2 v$ is equal to

   (a) zero   (b) $\dfrac{e}{\varepsilon_0}$

   (c) $\dfrac{-e}{\varepsilon_0}$ (d) $\dfrac{a}{\varepsilon_0}$

2. The force between two electric charges is directly proportional to

   (a) $\dfrac{1}{r}$ (b) $\dfrac{1}{r^3}$

   (c) $\dfrac{1}{r^2}$ (d) r^2

3. One tesla is equal to

   (a) $1N/A$ (b) $1N/Am$

   (c) $1NA/m$ (d) $1Nm/A$

4. The Lorentz law is given by

   (a) $E_{mag} = Q(\overline{V} \cdot \overline{B})$ (b) $\overline{P}_{mag} = \dfrac{\overline{V} \times \overline{B}}{Q}$

   (c) $\overline{F} = Q(\overline{V} \times \overline{B})$ (d) $\overline{F}_{mag} = \dfrac{\overline{V} \cdot \overline{B}}{Q}$

5. The energy per unit time per unit area transported by the fields is called

   (a) Laplace vector   (b) Lorentz vector

   (c) Faraday vector   (d) Poynting vector

6. The Ampere's law with Maxwell's correction

   (a) $\overline{\nabla} \times \overline{B} = \mu_0 \overline{J}$

   (b) $\nabla \times \overline{B} = \dfrac{\overline{J}}{\mu_0}$

   (c) $\nabla \times \overline{B} = \mu_0 \overline{J} + \mu_0 \, \epsilon_0 \, \dfrac{\partial \overline{E}}{\partial t}$

   (d) $\nabla \cdot \overline{B} = \dfrac{\overline{J}}{\mu_0}$

7. A wave guide is used for the propagation of

   (a) radio waves   (b) micro waves

   (c) IR   (d) uv

8. The distance taken to reduce the amplitude by a factor of 1/e is called

   (a) skin depth   (b) range

   (c) dispersion   (d) group velocity

9. Lienard Wiechert potential are for

   (a) moving point charge

   (b) moving monopole

   (c) moving dipole

   (d) moving quadrupole

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10. The maximum magnetic dipole moment is given by

   (a) $q_0 I$ (b) $q_0 d$

   (c) $\pi b^2 I_0$ (d) $2\pi I_0$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Determine energy due to point charge distribution.

   Or

   (b) Discuss in detail the work done by a moving point charge.

12. (a) Determine the multiple expansion of the vector potential.

   Or

   (b) Derive the relationship between magnetic susceptibility and permittivity in linear media.

13. (a) Obtain the Fraday's law in integral form.

   Or

   (b) Explain and obtain the boundary conditions on field vectors.

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14. (a) Derive the wave equation for E and B.

Or

(b) Describe the propagation of plane EM wave through the coaxial transmission line.

15. (a) Explain the radiation field of an electric dipole.

Or

(b) Describe and arrive the power radiated by a point charge.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Write the poisson equation and deduce the potential of a localized charge distribution.

Or

(b) Discuss in detail about the fields in dielectric material.

17. (a) Derive expression for Biot-Savarts law and Ampere's law and discuss their importance in electromagnetism.

Or

(b) Discuss the effect of magnetic field on atomic orbits.

18. (a) Derive an expression for Maxwell's stress tensor.

Or

(b) Deduce theoretically poynting vector and poynting theorem for the flow of energy in electromagnetic field.

19. (a) Explain and obtain all Fresnel equation for an electromagnetic wave incident obliquely.

Or

(b) Explain the propagation of TE waves in rectangular wave guide and get guide wavelength.

20. (a) Explain about electric dipole radiation and arrive the expression for A, E, B and total radiated power.

Or

(b) Explain about radiation reaction and the physical basis of radiation reaction.

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Nesamony Memorial Christian College, Marthandam