(6 pages) **Reg. No. :** .....

Code No. : 5562 **Sub. Code : KPHM 32/ PPHM 32**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2020.

Third Semester

Physics

ELECTRO MAGNETIC 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. The _____ law says about the force experienced between two stationary electric charges.

   (a) Faraday's (b) Coloumb's

   (c) Bio Savarat (d) Lawrentz

2. Electric force per unit charge is defined as

(a) Potential difference

(b) Electric field intensity

(c) Electric flux

(d) Magnetic flux

3. What is the unit of magnetic dipolemoment?

(a) ampere (b) ampere/m^2

(c) ampere m^2 (d) ampere/m

4. Platinum has permeability greater than unity and a small positive value for susceptibility. It is

(a) paramagnetic (b) diamagnetic

(c) ferromagnetic (d) ferrimagnetic

5. The differential form of the Faraday's law is

(a) $\nabla \cdot \overline{E} = \frac{-\partial \overline{B}}{\partial t}$

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

(c) $\nabla \times \overline{E} = \frac{-1}{\mu_0} \frac{\partial \overline{B}}{\partial t}$

(d) $\nabla \cdot \overline{E} = \frac{-1}{\mu_0} \frac{\partial \overline{B}}{\partial t}$

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

(a) Power (b) Lorentz force

(c) Poynting vector (d) Energy flux

7. A wave guide is a

(a) Solenoid

(b) Toroid

(c) Hollow pipe of in finite extent

(d) Spherical shell

8. The distance it takes to reduce the amplitude by a factor of $\frac{1}{e}$ is called

(a) skin depth (b) range

(c) dispersion (d) group velocity

9. Larmor formula gives the

(a) Total radiated power

(b) Radiation reaction force

(c) Dipole radiation

(d) Poynting vector

10. The blueness of the sky is due to the dependence of power on

(a) w^2 (b) $w^2 l^2$

(c) p^2 (d) w^4

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Find the electric field at a distance z above the midpoint of a straight line segment of length $2l$ which carries a uniform line charge λ.

Or

(b) Discuss about induced dipoles and atomic polarizability.

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

Or

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

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

Or

(b) State and prove the Poynting's theorem.

14. (a) Describe the propagation of EM waves in the coaxial transmission line.

Or

(b) Discuss the reflection and refraction of EM waves at normal incidence.

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

Or

(b) Describe the power radiated by the 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) Explain the method of images for induced surface charge and forced energy.

Or

(b) Discuss and derive expression for susceptibility, permittivity and dielectric constant of linear dielectrics.

17. (a) Derive Ampere's law from Biot–Savart law.

Or

(b) Explain about the effect of magnetic field on atomic orbit.

18. (a) Explain gauge transformation and arrive coulomb gauge and Lorentz gauge.

Or

(b) Use Maxwell stress tensor to determine the net force on the charges.

19. (a) Determine reflection and transmission co-efficients at oblique incidence.

Or

(b) What is a wave guide? Derive expression for EM waves in conductor wave guides.

20. (a) Discuss and deduce the retarded potentials and Lienard Wiechert Potentials.

Or

(b) Explain about magnetic dipole radiation and arrive the expression for A, E, B, S and total radiated power.

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