

(6 pages)

Reg. No. : .....

Code No. : 8842

Sub. Code : KPHM 32

M.Sc. (CBCS) DEGREE EXAMINATION,  
NOVEMBER 2017.

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. The electric charge in a conductor
  - (a) resides on the inner side of isolated conductor
  - (b) resides on the outer side of isolated conductor
  - (c) is equally distributed throughout
  - (d) is concentrated at the centre of conductor

2. Poisson equation states that

- |                                           |                                          |
|-------------------------------------------|------------------------------------------|
| (a) $\nabla^2 v = \frac{-\rho}{\epsilon}$ | (b) $\nabla^2 v = \frac{\rho}{\epsilon}$ |
| (c) $\nabla v = \frac{\rho}{\epsilon}$    | (d) $\nabla v = \frac{\rho^2}{\epsilon}$ |

3. The ratio of intensity of magnetic field at the centre of a very long solenoid to that at the extreme ends is

- |       |         |
|-------|---------|
| (a) 2 | (b) 1/2 |
| (c) 4 | (d) 1/4 |

4. When a substance is placed on a magnetic field at the centre of its ability to get magnetized depends upon its

- |                        |                    |
|------------------------|--------------------|
| (a) permeability       | (b) susceptibility |
| (c) magnetic viscosity | (d) permissivity   |

5. The idea of displacement current is due to

- |            |             |
|------------|-------------|
| (a) Ampere | (b) Faraday |
| (c) Gauss  | (d) Maxwell |

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. According to wave equation for electric field  $E$

(a)  $\nabla \cdot \vec{E} = \mu_0 \epsilon_0 \frac{\partial^2 E}{\partial t^2}$  (b)  $\nabla \times \vec{E} = \mu_0 \epsilon_0 \frac{\partial^2 \vec{E}}{\partial t^2}$

(c)  $\nabla^2 \vec{E} = \mu_0 \epsilon_0 \frac{\partial^2 E}{\partial t^2}$  (d)  $\nabla^2 \vec{E} = \frac{1}{\mu_0 \epsilon_0} \frac{\partial^2 \vec{E}}{\partial t^2}$

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

- (a) skin depth (b) range  
(c) dispersion (d) group velocity

9. Lienard Wiecher potential is for

- (a) Moving point charge  
(b) Moving dipole  
(c) Moving monopole  
(d) Moving qudrupole

10.  $F_{rad} = \frac{\mu_0 q^2}{6\pi c} \hat{a}$  is called formula of

- (a) Larmer  
(b) Lienard  
(c) Amour  
(d) Abraham-Lorentz

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Derive the work done to move a point charge.

Or

(b) Derive the expression for dielectric constant.

12. (a) Derive the expression for vector potential.

Or

(b) Narrate the physical interpretation of bound currents.

13. (a) Write down all Maxwell's equations in differential form and explain its physical significance.

Or

(b) Obtain the Coulomb and Lorentz gauges.

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

Or

(b) Derive the wave equation for  $E$  and  $B$ .



15. (a) Write short notes on cavity resonance.

Or

- (b) Show that in a wave guide  $TE_{01}$  mode exist while  $TM_{01}$  does not.

PART C — ( $5 \times 8 = 40$  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 a magnetic field on atomic orbits.

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

Or

- (b) What are electromagnetic waves? Show that  $E$  and  $H$  vectors are mutually perpendicular.

Page 5

Code No. : 8842

19. (a) Describe the propagation of plane electromagnetic wave through a conducting media.

Or

- (b) Arrive the reflection and transmission of electromagnetic waves at normal incidence. Explain them.

20. (a) Derive an expression for the guide wavelength of  $TE$  mode propagation in hollow rectangular waveguide.

Or

- (b) Describe cylindrical cavity and explain its theory.

Page 6

Code No. : 8842

