

Reg. No

Name

17P132

MSc DEGREE END SEMESTER EXAMINATION- NOVEMBER 2017

SEMESTER 1 : PHYSICS

COURSE : 16P1PHYT03 ; ELECTRODYNAMICS

(For Regular - 2017 Admission)

Time : Three Hours

Max. Marks: 75

Section A (Objective type)

Answer all the questions (1 Mark each)

1. Tangent loss can be described as
 - (a) The ratio of real part of the dielectric constant to the imaginary part of the dielectric constant.
 - (b) The ratio of imaginary part of the dielectric constant to the real part of the dielectric constant.
 - (c) real part of the dielectric constant
 - (d) imaginary part of the dielectric constant
2. The Laplacian of the magnetic vector potential will be
 - (a) $-\mu J$
 - (b) $-\mu I$
 - (c) $-\mu B$
 - (d) $-\mu H$
3. A free electron is placed in the path of a plane EM wave. The electron will start moving
 - (a) along E field
 - (b) along B field
 - (c) along direction of propagation, (k) of wave
 - (d) in a plane containing k and B
4. In a wave guide the velocity of energy propagation will be relative to the wave velocity.
 - (a) same
 - (b) different
 - (c) a or b
 - (d) none of these
5. The four vector X_4 represents
 - (a) Cartesian coordinate x
 - (b) Cartesian coordinate y
 - (c) Cartesian coordinate z
 - (d) ict

(1 x 5 = 5)

Section B (Short answer type)

Answer any Seven (2 marks each)

6. What do you mean by dielectric constant of a material?
7. Compare magnetostatics and electrostatics in terms of Maxwell's equations.
8. Define reflection coefficient and transmission coefficient.
9. Mention the advantages and disadvantages of Coulomb gauge.
10. What is the physical basis for radiation reaction?
11. Explain the concept of retarded position.

12. What is a plane wave?
13. Give a comparison between the antenna of a mobile phone and a satellite receiver.
14. What do you mean by Minkowski's force?
15. Write down four vector for proper velocity

(2 x 7 = 14)

Section C (Problems / Short Essays)

Answer any Four (5 Marks each)

16. Obtain the non-homogeneous wave equations for scalar and vector potentials.
17. How can we explain the color (and polarisation of light) of sky based on dipole radiation?
18. Plot the electric and magnetic fields of a charge moving with constant velocity.
19. A power gain test of a reference antenna and a test antenna resulted in the following data: a - input power to the reference antenna - 400 mW, b - input power to the test antenna - 100 mW. Estimate the power gain
20. Obtain Lorentz force law in Potential form.
21. Obtain the transformation matrix for Lorentz transformation.

(5 x 4 = 20)

Section D (Essays)

Answer all questions (12 Marks each)

- 22(a) Prove Snell's law of reflection using oblique incidence of plane wave at a plane conducting boundary.

OR

- (b) State Poynting's theorem and obtain its integral and differential form. Write down Poynting's vector and give its physical meaning.

- 23(a) From Lienard Wiechert potentials, obtain the expression for fields of a moving charge.

OR

- (b) Obtain the expression for power radiated by an electric dipole.

- 24(a) For the case of parallel plate waveguide, obtain TE solutions.

OR

- (b) Derive the general transformation rules for electromagnetic fields.

(12 x 3 = 36)