J – 1190

Reg. No. : ....

Name : ....

Fourth Semester B.Sc. Degree Examination, March 2020

First Degree Programme Under CBCSS

Physics

Core Course III

PY 1441 – ELECTRODYNAMICS

(2014-17 Admissions)

Time : 3 Hours   Max. Marks : 80

Symbols used in this question paper have their usual meanings.

SECTION – A

Answer **all** questions. Each question carries **1** mark.

1. What is electric potential?

2. Write Differential form of Gauss's law?

3. Give electric field in terms of surface charge density

4. Write one dimensional wave equation.

5. What is Lorentz force in electro magnetism?

6. What do you mean by monochromatic plane waves?

7. Give wave impedance in electromagnetic wave propagation.

8. Explain Faraday's law.

9. What is time constant in C-R circuit?

10. What do you mean by capacitive impedance?

(10 × 1 = 10 Marks)

SECTION – B

Answer **any eight**. Each question carries **2** marks.

11. Describe the electric field as negative gradient of potential.

12. Derive the equation for electric displacement in dielectric medium.

13. Describe the Cyclotron motion of charge in magnetic field and get its frequency.

14. Arrive at the relation between dielectric constant and electric susceptibility.

15. Derive Poisson's and Laplace equations.

16. Describe the hysteresis of a ferromagnetic material.

17. Write the electromagnetic equations and bring about the corrections introduced by Maxwell.

18. Write about magnetic vector potential.

19. Explain the high resistance measurement by leakage method.

20. Explain resonance in a series LCR circuit.

21. What do you mean by skin effect?

22. Explain thevenins theorem.

(8 × 2 = 16 Marks)

SECTION – C

Answer **any six.** Each question carries **4** marks.

23. Find the electric field due to a uniformly charged solid cylinder both inside and outside the cylinder.

24. A soap bubble is formed at one end of an open glass tube with soap solution of surface tension T= 0.025N/m. What should be the charge on it to keep its radius as 6mm. (Given, inward pressure due to surface tension is 4T/R).

25. A point charge of 10^{-7}C is situated at the centre of a cube of 1 cm side. Calculate the electric flux through its surface.

26. If the relative permittivity of silicon crystal at optical frequencies is 12, determine the velocity of light inside silicon crystal.

27. A cyclotron has an oscillator frequency of 12 x 10^6 cycles per second and a disc radius of 50 cm .What value of magnetic induction B is needed to accelerate protons? Mass of proton = 1.67 x 10^{-27} Kg.

28. A particle of charge 10^{-20}C is moving with a velocity 8 x 10^6 i m/s. It enters a region of electric field 10^6 jV/m and magnetic field 0.2 k T . Find the force on it.

29. A capacitor of capacitance 0.01 micro Farad is first charged and then discharged through a resistance of 10 mega ohm. Find the time the potential will take to fall half its original value.

30. Prove that for an ideal constant voltage source the internal resistance of the source should be zero.

31. An ac of 200V, 50 HZ is applied to a capacitor in series with a 20 V,5 W lamp. Find the capacitance.

(6 × 4 = 24 Marks)

SECTION – D

Answer **any two** questions. Each question carries **15** marks.

32. What do you mean by electric field intensity? Find out the electric field due to a charged sheet, and two parallel infinite sheets.

33. Give physical interpretation of bound charges in an insulator. Also show that the surface charge density is equal to the amount of polarization normal to the face and volume charge density is negative divergence of polarization for a non uniformly polirized object.

34. Discuss about the growth and decay of current in an inductor through a resistor.

35. Explain Maximum power transfer theorem with proof. Deduce the maximum efficiency.

(2 × 15 = 30 Marks)

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