G – 4075

Reg. No. : ....

Name : ....

Fourth Semester B.Sc. Degree Examination, July 2019

(First Degree Programme Under CBCSS)

Physics

Core Course III

PY 1441 : ELECTRODYNAMICS

(2014 Admission onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions; **each** question carries **1** mark.

1. What is Coulomb's Law?

2. Write mathematical expression for Electric field.

3. Write the properties of Electric field lines.

4. Write Biot-Savart law.

5. What do you mean by Induced emf?

6. What is Lorentz force?

7. Give wave equation in terms of electric field.

8. Explain Inductive impedance in a circuit.

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

10. Write about constant voltage source.

<div align="right">(10 × 1 = 10 Marks)</div>

SECTION – B

Answer any **eight** questions; **each** question carries **2** marks.

11. Give notes about electric conductors and its basic properties.

12. Write Poisson's and Laplace's equations.

13. What do you mean by electric potential? Give its expression

14. What is Polarisation and explain polarisability tensor?

15. Explain Ampere's circuit law.

16. Describe briefly different types of magnetic materials.

17. Describe Maxwell's electromagnetic equations.

18. Write about equation of continuity.

19. Prove that magnetic field B is solenoid.

20. What is Q-factor? How is it related to the sharpness of resonance of circuit?

21. Explain Maxwell's ac bridge.

22. How to Theveninz a circuit?

<div align="right">(8 × 2 = 16 Marks)</div>

SECTION – C

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

23. A parallel plate capacitor of plate area $10^{-2} m^2$ and plate separation $10^{-2} m$ is charged to 100V. Calculate the free charge on the plates of the capacitor.

24. An electron accelerated by 300 V enters a magnetic field of 0.05 T at an angle of 30°. Find the radius of the helical path and the angular velocity of electron.

25. A long straight wire carries a current 3A. An electron travels at a speed of $5 \times 10^4 m/s$ parallel to the wire 0.10m from it and in a direction opposite to the current. Calculate the force experienced by the electron in the magnetic field of the current.

26. A parallel plate capacitor of capacitance $C_0 = 13.5 \, pF$ has a potential difference 12.5 V between the plates. Now charging battery is disconnected and a slab of dielectric constant K= 6.5 is inserted between the plates. Find the energy stored in the capacitor both before and after the slab is introduced and hence energy difference.

27. Find the density (charge/volume) of mobile charges in a piece of copper, assuming each atom contributes2 free electrons .Given molar mass of copper 64×10^{-3}, density of copper $9 \times 10^3 \, kg/m^3$ and Avogadro number is 6×10^{23}.

28. Find the electric potential on the surface of nucleus having mass number 64 and atomic number A = 30. The charge on the proton is $1.6 \times 10^{-19} C$ and the radius of nucleus is given by $R = R_0 A^{1/3}$, where $R_0 = 1.2 \times 10^{-15} m$.

29. A capacitor is charged by a dc supply through a resistance 2 mega ohm. If it takes 1 second for the charge to reach 1/2 of its final value, what is the capacitance of the capacitor?

30. Show that maximum power is transferred to the load when the load resistance is equal to the internal resistance

31. A lamp having filament of 15 ohm resistance is not allowed to pass more than 3A current. Find the value of inductance which must be used in series with the lamp which is supplied by an ac of maximum emf 210 V at 50 HZ.

(6 × 4 = 24 Marks)

SECTION – D

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

32. State and explain Gauss's law in electro statics. Discuss the variation in electric field intensity due to a charged spherical shell. Represent it graphically.

33. Prove that the path of the motion of an electric charge under transverse electric and magnetic field is cycloid.

34. Discuss about the charging of a capacitor through an inductor and resistor.

35. Discuss the passage of ac through a series LCR circuit. And describe the resonance.

$$(2 \times 15 = 30 \text{ Marks})$$

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