



# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

## B.Sc.DEGREE EXAMINATION –PHYSICS

FIFTH SEMESTER – APRIL 2019

### PH 5512– ELECTRICITY AND MAGNETISM

Date: 16-04-2019  
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

#### PART-A

Answer ALL Questions

(10x2=20)

1. Calculate the potential at a point due to a charge of  $100 \mu\text{C}$  at a distance of 9 m.
2. The dielectric constant of water is 78. Calculate its electrical permittivity.
3. Mention any two uses of potentiometer.
4. Define Thomson coefficient.
5. State Ampere's circuital law.
6. State Faraday's laws of electromagnetic induction.
7. What is meant by the time constant of a L-R circuit?
8. State any two differences between series and parallel resonant circuits.
9. What is meant by hysteresis?
10. Define poynting vector.

#### PART-B

Answer ANY FOUR Questions

(4X7.5=30)

11. State Gauss law. Derive it in the presence of a dielectric medium. (2+5.5)
12. Obtain Claussius-Mossotti equation.
13. i) State Kirchoff's laws. (2)  
ii) Two cells of emf 1.5 V and 2 V respectively and of internal resistance 1 and 2 respectively are connected in parallel with an external resistance of 5 . Calculate the current in each branch of the network. (5.5)
14. State Biot-Savart law. Use it to calculate the magnetic induction due to a current in a circular coil of wire at a point on its axis. (2+5.5)
15. Obtain an expression for the power in an A.C. circuit. When does the current in A.C. circuit become wattless?  
(6.5+1)

16. A plane electromagnetic wave is incident normally at the boundary of two non conducting media.

Discuss the phenomenon of reflection and refraction.

**PART-C**

Answer ANY FOUR Questions :

**(4x12.5 = 50)**

17. What is an electric dipole? Derive an expression for the potential and field at any point due to an electric dipole. **(2+10.5)**

18. Explain with necessary theory how a Carey Foster bridge may be used to compare two nearly equal resistances. Hence show how the specific resistance of the material of the wire can be determined.

**(10 + 2.5)**

19. i) Explain the thermo-electric diagram. Use it to determine Peltier and Thomson emfs.

**(3.5+4)**

ii) Determine the mutual inductance between two coaxial solenoids. **(5)**

20. Explain the construction and working of a moving coil ballistic galvanometer. Derive an expression for the quantity of charge flowing through it and the throw obtained. How can the observed throw be corrected for damping? **(5.5+4+3)**

21. i) Obtain an expression for the growth of charge in LCR circuit. **(6.5)**

ii) a) Find out whether the discharge of a capacitor through a circuit containing the following elements, is oscillatory.  $C=0.2 \mu\text{F}$ ,  $L=10 \text{ mH}$ ,  $R=250 \Omega$ . b) If so, find the frequency. c) Calculate the maximum value of the resistance possible so as to make the discharge oscillatory.

**(2+2+2)**

22. i) Give an account of Langevin's theory of paramagnetism. Discuss the failure of Langevin theory.

**(6.5)**

ii) What is meant by a) Coercivity b) Retentivity c) Magnetic permeability. **(2+2+2)**

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