LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **PHYSICS**

FOURTH SEMESTER – **APRIL 2023**

16/17/18UPH4MC01 – ELECTRICITY AND MAGNETISM

Date: 02-05-2023   Dept. No.   Max. : 100 Marks
Time: 09:00 AM - 12:00 NOON

PART – A	**(10 x 2 = 20 Marks)**

Q. No.   **Answer ALL questions**

1   Calculate the magnitude of electric field which can just balance a deutron of mass 3.2×10^{-27} kg against gravity.

2   State Coulomb's law in electrostatics.

3   What is polarization?

4   Define capacitance of the capacitor.

5   What is a dielectric? Give some examples.

6   What happens if a rectangular loop carrying current kept in a magnetic field?

7   State Faraday's first law of electromagnetic induction.

8   Define 1 henry.

9   Distinguish between conduction and displacement currents.

10   Write all four Maxwell's equation in differential form.

PART – B	**(4 x 7.5 = 30 Marks)**

Answer any FOUR questions

11   State and prove Gauss's law in electrostatics.

12   What is dielectric breakdown? Discuss all the types of dielectric breakdown.

13   Derive an expression for the magnetic induction due to a dipole in the broad-side on position.

14   Write a short note on different mechanisms for change of magnetic flux.

15   Derive an expression for the force on a conductor carrying current placed in a magnetic field.

16   Deduce the equation for the propagation of the plane electromagnetic waves in free space.

PART – C	**(4 x 12.5 = 50 Marks)**

Answer any FOUR questions

17   Find the electric field at a distance 'z' above the midpoint of a straight-line segment of length 2L which carries a uniform line charge.

18   State Biot-Savart Law. Derive an expression for the magnetic induction at a point due to current carrying circular coil.

19   (i) Establish the expression for the magnetic force acting between two long, parallel current carrying   conductors.
(8)
(ii) Two long parallel straight wires A and B carrying currents of 1 A and 4 A in the same direction   are separated by a distance of 2 cm. Estimate the force on a 10 cm section of wire A.

1

(4.5)

20   What is a toroid? Apply Ampere circuital law to find the magnetic field at any point (i) on (ii) inside and (iii) outside the toroid. (2+4+4.5)

21   Write a short note on mutual induction. Derive an expression for the mutual inductance of two long coaxial solenoids. (4.5+ 8)

22   State and prove Poynting theorem for the flow of energy in an electromagnetic field.

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