

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**  
(MID SEMESTER EXAMINATION SP/2024)

CLASS: IMSc  
BRANCH: MATHS & COMPUTING

SEMESTER : II  
SESSION : SP/2024

SUBJECT: PH109 PHYSICS-I

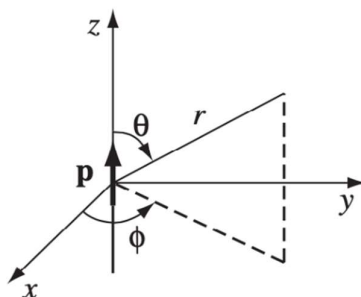
TIME: 02 Hours

FULL MARKS: 25

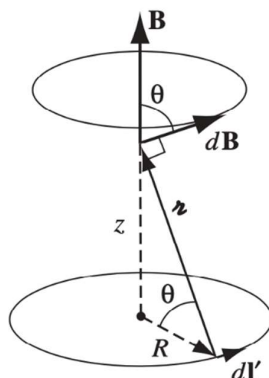
**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

			CO	BL
Q.1(a)	Define electrostatic potential. How is it related to the Electric Field ?	[2]	1	1
Q.1(b)	Determine the expression for the capacitance of a parallel plate capacitor. What are the various ways to increase its capacitance ?	[3]	2	5
Q.2(a)	Define electric dipole moment $\vec{p}$ . What happens when an electric dipole is placed in a uniform, external electric field $\vec{E}$ ?	[2]	2	1
Q.2(b)	Evaluate the expression for the electric field due to an electric dipole at a distance $r$ from it (as shown in the Figure).	[3]	1	5



Q.3(a)	Define Di-electric polarization vector ( $\vec{P}$ ). How is it related to the Di-electric displacement vector ( $\vec{D}$ ) for a linear, homogeneous, isotropic di-electric medium ?	[2]	1	1
Q.3(b)	Determine the boundary conditions satisfied by the fields $\vec{E}$ and $\vec{D}$ at the interface between two different di-electrics.	[3]	2	5
Q.4(a)	What is Biot-Savart law ? Use it to estimate the magnetic field a distance $z$ above the center of a circular loop of radius $R$ , which carries a steady current $I$ (See Figure below).	[3]	2	6



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|--------|--|-----|---|---|
| Q.4(b) | What is Lorentz force law ? Use it to show that Magnetic forces don't do any work.   | [2] | 2 | 1 |
| Q.5(a) | Define: Atomic number (Z) and mass number (A) of a nucleus. What are the differences between: Isotopes, Isobars and Isotones ?                                   | [2] | 3 | 1 |
| Q.5(b) | What is binding energy (B.E) of a nucleus ? Draw the binding energy per nucleon (B.E/A) vs mass number (A) curve and explain its salient features qualitatively. | [3] | 3 | 5 |

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