BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2025)

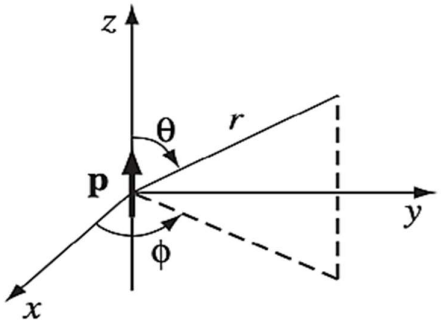
CLASS: INT. MSc **SEMESTER : II**
BRANCH: MATHS & COMPUTING **SESSION : SP/2025**

SUBJECT: PH109 PHYSICS-I

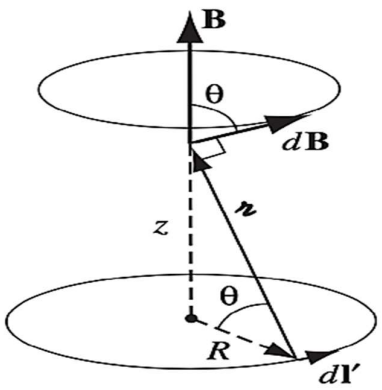
TIME: 02 Hours **FULL MARKS: 25**

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]	1	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]	1	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]	1	5
Q.4(a)	What is Lorentz force law ? Use it to show that Magnetic forces don't do any work.	[2]	2	1
Q.4(b)	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	3



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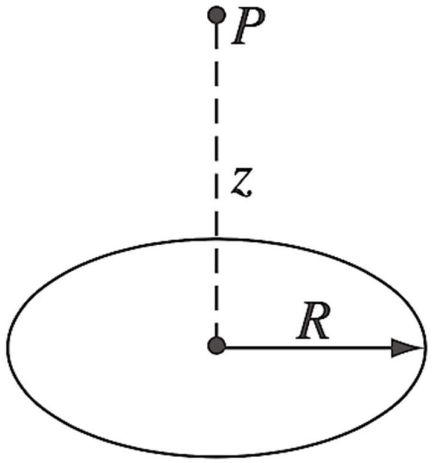
Q.5(a)	Define Gauss law of electrostatics.	[2]	1	1
Q.5(b)	Find the electric field at a distance z above the center of a flat circular disc of radius R (See Figure below) that carries a uniform surface charge σ.	[3]	1	3



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