

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP2023)

CLASS: IMSc
BRANCH: PHYSICS

SEMESTER : II
SESSION : SP/2023

SUBJECT: PH102 ELECTRICITY AND MAGNETISM

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)	State and prove the differential form of Gauss's law in electrostatics.	[2]	I V
Q.1(b)	Apply this law to calculate the electric field due to a uniformly charged sphere.	[3]	I III
Q.2(a)	Show that the vector field $F = (x+3y)\hat{i} + (y-3z)\hat{j} + (x-2z)\hat{k}$ is solenoidal.	[2]	I I
Q.2(b)	Explain uniqueness theorem.	[3]	I II
Q.3(a)	What do you mean by bound charges?	[2]	II I
Q.3(b)	Discuss dielectric polarization and electric displacement.	[3]	II VI
Q.4(a)	What do you mean by energy density in electrostatic field?	[2]	II I
Q.4(b)	Estimate the maximum amount of electrostatic energy that can be stored in 1m^3 volume of air. Given the dielectric strength of air $3 \times 10^6 \text{ V/m}$.	[3]	II VI
Q.5(a)	Define Biot-Savart law in vector form.	[2]	III I
Q.5(b)	Starting from Biot-Savart law show that magnetic field is non divergent.	[3]	III II

:::::24/05/2023:::::M