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

CLASS: IMSc **SEMESTER : III**
BRANCH: PHYSICS **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 $F= (x+3y)\hat{I} + (y-3z)\hat{j} + (x-2z)\acute{K}$ 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 3×10^6 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

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