BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MTECH/MSC/IMSC **SEMESTER : I/VII**
BRANCH: SER/PHYSICS **SESSION : MO/2022**

SUBJECT: PH402 ELECTRODYNAMICS

TIME: 3:00 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a)	Explain quantization of Charge and conservation of charge. [BT II, CO1]	[2]
Q.1(b)	Prove that the electric field at a point is defined as the gradient of the potential at that point. [BT V, CO1]	[3]
Q.1(c)	Determine an expression for the potential at a point due to electric quadrupole. [BT V, CO1]	[5]
Q.2(a)	What do you understand by electric flux density? [BT I, CO2]	[2]
Q.2(b)	Discuss the necessity of introducing the vector D in presence of dielectric medium. How is D related to P and E. [BT VI, CO2]	[3]
Q.2(c)	Draw and discuss the magnetization curves for soft iron and steel as they are taken through a complete cycle of magnetizing field. [BT VI, CO2]	[5]
Q.3(a)	Distinguish between conduction and displacement current. [BT IV, CO3]	[2]
Q.3(b)	Find the wavelength and propagation speed in Copper for radio waves at 1 MHz. For Copper assume $\mu = \mu_0$, $\varepsilon = \varepsilon_0$ and conductivity $\sigma = 5.8\times10^7 (\Omega m)^{-1}$ [BT I] [BT IV] [CO3]	[3]
Q.3(c)	Explain and establish Poynting's theorem. [BT V, CO3]	[5]
Q.4(a)	Find the energy stored in a one-meter length of a Laser beam operating at 1mW. [BT I, CO4]	[2]
Q.4(b)	EM wave is incident normally from air on air-glass interface. Taking refractive index of the glass is 1.5 determine the amplitude reflection coefficient and the percentage of total incident energy that is transmitted into glass. [BT V, CO4]	[3]
Q.4(c)	An EM wave is incident on the plane interface between two different media. Show that the wave vectors of the incident, reflected and refracted waves all lie on the same plane. [BT II, CO4]	[5]
Q.5(a)	What do you mean by polarization of a plane electromagnetic wave? [BT I, CO5]	[2]
Q.5(b)	Discuss retarded potential. [BT VI, CO5]	[3]
Q.5(c)	Develop the expression for the magnetic vector potential at far fed (radiation) zone. [BT III, CO5]	[5]

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