

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

CLASS: IMSc
BRANCH: PHYSICS

SEMESTER : VI
SESSION : SP/2024

SUBJECT: PH315 ELECTROMAGNETIC THEORY

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
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		CO	BL
Q.1(a)	Discuss any two properties of Maxwell's equations.	[2]	1 6
Q.1(b)	Determine the expression for the velocity of electromagnetic wave in isotropic dielectric medium.	[3]	1 5
Q.2(a)	What do you understand by coulomb gauge?	[2]	1 1
Q.2(b)	Derive the relationship for time varying electric field in term of scalar potential and vector potential.	[3]	1 4
Q.3(a)	Define skin depth?	[2]	2 1
Q.3(b)	Show that plane electromagnetic wave is attenuated as it propagates through the conducting medium.	[3]	2 2
Q.4(a)	If earth receives $2 \text{ cal min}^{-1}\text{cm}^{-2}$ solar energy. Develop the expression for amplitudes of electric and magnetic field of radiation?	[2]	2 6
Q.4(b)	Consider the propagation of EM wave through dilute ionized gases. Hence, show that the critical frequency below which wave propagates through it is not possible is given by $f_c = 9 (n_o)^{1/2}$. Where n_o is the electrons per unit volume.	[3]	2 2
Q.5(a)	Define magnetic diffusivity.	[2]	3 1
Q.5(b)	Develop the boundary conditions satisfied by electromagnetic field vector E and D at the interface between two different media.	[3]	3 3

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