

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

CLASS: MSc/ ISc  
BRANCH: Physics

SEMESTER : I/VII  
SESSION : MO/2025

**SUBJECT: PH402 ELECTRODYNAMICS**

TIME: 3 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.
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		CO	BL
Q.1(a)	Determine the multipole expansion of the potential for arbitrary charge distribution.	[5] 1	5
Q.1(b)	A point charge is placed in front of an earthed conducting plane. Using method of images evaluate potential and field at an external point.	[5] 1	5
Q.2(a)	Show that the magnetic moment associated with the orbital motion of an electron in an atom must be an integral multiple of some basic unit.	[5] 2	2
Q.2(b)	Build the boundary conditions satisfied by B and H at the interface of two media of different permeabilities.	[5] 2	6
Q.3(a)	Explain how Maxwell generalized Ampere's circuital law. Hence, discuss the concept of displacement current.	[5] 3	2
Q.3(b)	An electromagnetic wave is incident on the plane interface between two different media. Show that the frequency of the wave remains unchanged after reflection or refraction.	[5] 3	2
Q.4(a)	Starting from Maxwell's equations develop the wave equation in conducting medium. Define skin depth.	[5] 4	3
Q.4(b)	Find the skin depth $\delta$ at a frequency of 1.6MHz in steel medium. Given $\sigma = 38.2 \times 10^6$ s/m and $\mu_r = 1$ .	[5] 4	1
Q.5(a)	What is Larmor formula? Write its significance.	[5] 5	1
Q.5(b)	Explain Lienard-Wiechert potential.	[5] 5	2

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