M.Sc. DEGREE END SEMESTER EXAMINATION - NOVEMBER 2025
SEMESTER 1 : PHYSICS
COURSE : **24P1PHYT03 : ELECTRODYNAMICS**
(For Regular - 2025 Admission and Improvement / Supplementary 2024 Admission)

Time : Three Hours　　　　　　　　　　　　　　　　Max. Weights: 30

PART A

Weight: 1

Answer any 8 questions

1.	Discuss the idea of radiation reaction.	(U)
2.	What are plane waves?	(U)
3.	What are the various origins of magnetic field?	(R)
4.	State whether the following statement is true or false with your explanation." *Among two identical masses moving under the influence of the same force, the charged one move slowly than the uncharged one".*	(An)
5.	Give the expression for average value of Poynting vector of an EM wave.	(R)
6.	What is characteristic impedance?	()
7.	Give the expression for average value of energy density of an EM wave.	(R)
8.	TEM mode is not supported by a rectangular waveguide. Why?	(A)
9.	Give an account of susceptibility tensor.	(R)
10.	What are the various origins of emf?	(R)

(1 x 8 = 8)

PART B

Weights: 2

Answer any 6 questions

11.	Write the real fields of a monochromatic planewave traveling from origin to (1,1,1) and polraized in z direction. Sketch the wave.	(A)
12.	Find the electric field inside a sphere which carries a charge density proportional to the distance from the origin (or center).	(A)
13.	How can we explain the color (and polarisation of light) of sky based on dipole radiation?	(A)
14.	The intensity of sunlight hitting earth is about 1300 W/m^2. If sunlight hits a perfect absorber and a perfect reflector, what pressure does it exert?	(A)
15.	Find the first and second order cut off wavelengths of TM and TEM modes of a rectangular waveguide with a = 1.5 cm and b = 2 cm.	(A)
16.	Write electromagnetic field tensor in terms of four vector potential. Show that F12 = B3.	(A)
17.	Prove that the field is uniquely determined if the charge density is given and either potential or the normal derivative of potential is specified on a boundary.	(A)
18.	An infinite straight wire carries a current I_0, which is turned on at t = 0. Find the resulting electric and magnetic fields.	(A)

(2 x 6 = 12)

PART C

Weights: 5

Answer any 2 questions

19. Starting from the expression for fields of a moving charge, obtain the expression for power radiated by a moving point charge. Hence describe radiation reaction and obtain the Abraham-Lorentz formula. Also discuss the 'disturbing implications' of the Abraham-Lorentz formula. (A)

20. Derive Maxwell`s equations, in free space. Explain their physical implications. Show how Maxwell corrected Ampere`s law. (U)

21. Derive Fesnel equations. Plot reflected and transmitted amplitudes. (A)

22. Derive the general transformation rules for electromagnetic fields. (A)

(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;