

NORTH GAUHATI COLLEGE
PHYSICS DEPARTMENT
ASSIGNMENT-2025
PAPER: ELECTROMAGNETIC THEORY
SEMESTER: 3rd SEMESTER

Total Mark: 15

Last date of submission: 20/11/2025

1. In a medium of dielectric constant 5, the maximum displacement current is equal to the maximum displacement current at a frequency of 1 MHz. What is the conductivity of the medium? 2
2. An em wave is incident normally on the surface of water of refractive index 1.33. Calculate the percentage of incident intensity transmitted into water. 2
3. What should be the angle of sun above the horizon, so that the sunlight reflected from the surface of water of a still lake is plane polarized? (Refractive index of water=1.33) 2
4. The electric field of a plane wave in a sea water at its surface ($z=0$) is given by 1+2+1=4
$$\vec{E} = \hat{i}100 \cos(10^7 \pi t) \text{ V/m.}$$

For sea water, $\epsilon = 72\epsilon_0 \text{ F/m}$

$$\mu = 4\pi \times 10^{-7} \text{ H/m}$$
$$\sigma = 4(\Omega\text{m})^{-1}$$
 - a) Determine whether sea water acts as a good conductor or not.
 - b) Find the phase velocity and the skin depth.
 - c) At what depth below the surface does the amplitude $\vec{E}$ drop to 1% of its value at the surface.
5. The electric field $\vec{E}$ of a plane wave in air is given by 1+2+2=5
$$\vec{E} = \hat{i}4 \times 10^{-6} \cos(10^7 \pi t - kz) + \hat{j}4 \times 10^{-6} \sin(10^7 \pi t - kz) \text{ V/m.}$$

Find the value of k , the magnetic field and the Poynting vector.

Note: The assignment must be submitted to Dr. Dhrubajit Kalita on or before 20/11/2025