Graphic Era HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

Term Evaluation (Odd) Semester Examination September 2025

Roll no.....

Name of the Course: B. Tech (ECE)
Semester: V
Name of the Paper: Electromagnetic Waves
Paper Code: TEC 503
Time: 1.5 hour **Maximum Marks: 50**

Note:
(i) Answer all the questions by choosing any one of the sub-questions
(ii) Each question carries 10 marks.

Q1. (10 Marks)

a. Given vectors $\vec{A} = 2\hat{a}_x + 2\hat{a}_y - \hat{a}_z$, $\vec{B} = \hat{a}_x - 3\hat{a}_y + 4\hat{a}_z$ and $\vec{C} = \hat{a}_x - \hat{a}_y + \hat{a}_z$. Determine **CO1**

(i) $\left|\vec{A} + \vec{B} + \vec{C}\right|$

(ii) $\vec{A} - \vec{B} + \vec{C}$

(iii) dot product of $\vec{B}$ and $\vec{C}$

(iv) $\vec{A} \times \vec{B} \bullet \vec{C}$

OR

b. Discuss Divergence Theorem and Stokes' Theorem and explain their applications in electromagnetics. **CO1**

Q2. (10 Marks)

a. State and explain Coulomb's Law. How does this law form the foundation of classical electromagnetics? **CO1**

OR

b. Derive the integral and differential forms of Gauss's law for electricity and explain their physical significance. **CO1**

Q3. (10 Marks)

a. What is an electrostatic boundary condition? Explain boundary conditions in two different media in detail. **CO1**

OR

b. Explain Ampere's circuit law and subsequently find out Maxwell's third equation in both differential and integral form. **CO1**

Q4. (10 Marks)

a. What do you mean by an electromagnetic wave? Calculate the wavelength and time period of a wave moving in the positive x-axis. **CO2**

OR

b. Differentiate between phase velocity and group velocity. Derive mathematical expressions for both. **CO2**

Q5. (10 Marks)

a. Derive the expression for the time-averaged Poynting vector and explain its role in power transmission. **CO2**

OR

b. Discuss different types of wave polarization (linear, circular, elliptical). **CO2**