

Code: EC4T4

**II B.Tech - II Semester–Regular/Supplementary Examinations
April 2019**

**ELECTRO MAGNETIC FIELDS AND WAVES
(ELECTRONICS & COMMUNICATION ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11 x 2 = 22 M

1.

- a) A scalar function, V is given by $V = xyz^2$. Find the gradient of V .
- b) If a vector $B = 4xy^2 a_x + 2y^3 a_y + xyz a_z$. Find the divergence of B .
- c) State the applications of Gauss's law.
- d) Find the capacitance of an isolated sphere of radius 1 cm.
- e) State Ampere's circuit law.
- f) A solenoid with length 10 cm and radius 1 cm has 450 turns. Calculate its inductance.
- g) Give the relation between magnetic flux density and magnetic field intensity.
- h) Write the Maxwell's equations in integral form for time varying fields.
- i) What are the transformer and motional electromotive forces (emfs) in the context of Faraday's law?

- j) Derive the reflection coefficient of a uniform plane wave incident normally on an interface between two different media.
- k) Define the concept of depth of penetration.

PART – B

Answer any **THREE** questions. All questions carry equal marks.
3 x 16 = 48 M

2. a) State and Prove Stoke's theorem. 8 M
- b) Determine the flux of $D = \rho^2 \cos^2 \phi a_\rho + z \sin \phi a_z$ over the closed surface of a cylinder $0 \leq z \leq 1$, $\rho = 4$. Verify the divergence theorem for this case. 8 M
3. a) Explain the following terms.
- i) Homogeneous and isotropic medium and
 - ii) Line, surface and volume charge distributions. 8 M
- b) State and explain Relaxation time and Derive the equation of continuity. 8 M
4. a) Consider two current loops, by using Biot-Savart's law, determine the total force F_1 on current loop1 due to current loop2. 8 M

- b) A 60-turn coil carries a current of 2A and lies in the plane $x + 2y - 5z = 12$ such that the magnetic moment \mathbf{m} of the coil is directed away from the origin. Calculate \mathbf{m} , assuming that the area of the coil is 8 cm^2 . 8 M
5. a) State Ampere's circuital law. Specify the conditions to be met for determining magnetic field strength H , based on Ampere's circuital law.
 What is the Pit fall of Ampere's law?
 How is it corrected in Electro magnetic fields or for a time varying fields? 8 M
- b) In a medium of $\mu_r = 2$, find E , B and displacement current density if $H = 25 \sin(2 \times 10^8 t + 6x) \mathbf{a}_y \text{ mA/m}$. 8 M
6. a) What is meant by polarization of a wave? Explain Linear polarization, circular polarization and elliptical polarization. 8 M
- b) Derive the expression for attenuation and phase constants of uniform plane wave in Conductors & Dielectrics. 8 M