

Code: 19EC3402

II B.Tech - II Semester – Regular Examinations – AUGUST 2021

**ELECTROMAGNETIC WAVES
(ELECTRONICS & COMMUNICATION ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

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- Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 5 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each question carries 12 marks.
4. All parts of Question paper must be answered in one place
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PART – A

1. a) Give the relationship between electric field intensity and electric Potential.
- b) State Ampere's Circuital Law.
- c) Write Maxwell's Equations for Free Space in Point Form.
- d) Define Skin Depth.
- e) Write the wave equation in free space.

PART – B

UNIT – I

2. a) Derive the expression for electric field intensity due to infinite line charge. 6 M
- b) Eight Identical Charges Q each are placed on the corners of the cube of side 'a'. Find the resultant force on the Charge. 6 M

OR

3. a) State and Explain Gauss's Law. 6 M
b) Starting from the Point Form of Gauss's law, derive Laplace equation and Poisson's equation. 6 M

UNIT – II

4. a) State and explain the Biot-Savart's law and derive the expressions for the magnetic field intensity due to surface and volume currents. 6 M
b) What is Lorentz's force Law? Derive an expression for Magnetic Vector Potential. 6 M

OR

5. a) Explain Ampere's circuital Law for steady currents. Mention its Application and Limitations. 6 M
b) Derive an expression for the energy density of the steady magnetic fields. 6 M

UNIT-III

6. a) What is the Faraday's Law of Induction? Explain the significance of the terms 'transformer emf' and 'generator emf'. 6 M
b) In free space, $D = D_m \sin(\omega x + bz)$. Determine B and displacement current density. 6 M

OR

7. a) What is the significance of Maxwell's equations?
Mention them in Various forms. 6 M
- b) A copper wire carries a conduction current of 1A.
Determine the displacement current in the wire of
100MHz. Take $\epsilon = \epsilon_0$ and conductivity $\sigma = 5.8 \times 10^7 \Omega/m$ 6 M

UNIT – IV

8. a) Derive the wave equations for conducting medium from
Maxwell's equations. 6 M
- b) Derive the expression for the Propagation constant,
attenuation Constant and Phase shift constant for a
perfect dielectric and good conductor. 6 M

OR

9. a) What is the Uniform plane wave? Show that the field in
the Uniform Plane wave is independent of two
dimensions. 6 M
- b) What is polarization and explain different types of
Polarization? 6 M

UNIT – V

10. a) Analyze the reflection of a Plane wave from a plane
surface of a perfect conductor for Oblique incidence. 6 M
- b) Derive an expression for reflection and transmission
co-efficient for an Obliquely incident perpendicular
Polarization. 6 M

OR

11. a) Find the reflection co-efficient of a plane wave when the reflection is from a plane surface of a perfect dielectric for the Normal Incidence. 6 M
- b) Calculate the Brewster angle for an air water $\epsilon_r=81$ interface at which plane waves pass from the following:
- (i) Air into water.
 - (ii) Water into air. 6 M