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**Rejinpaul.com Anna University Semester Exam Important Questions**

**EE8391 ELECTROMAGNETIC THEORY**

**PART B & PART C QUESTIONS**

### Unit I

1. State and prove Divergence theorem.
2. Obtain the curl in the spherical co ordinate system.
3. a) State and prove Gauss law. Explain its application. b) Obtain the expression for electric field intensity due to a uniformly charged line of length  $l$ .
4. State and prove Stoke's theorem.
5. Derive the expression for electric field intensity due to uniformly charged circular disc of  $\sigma$  C/m<sup>2</sup>.

### Unit II

1. Derive the expression for energy and energy density in the static electric field.
2. a) Find the potential at  $r_A=5$  m with respect to  $r_B=15$ m due to point charge  $Q = 500$ pC at the origin and zero reference at infinity.  
b) Find the capacitance of parallel plate capacitor with dielectric  $\epsilon_{r1}=1.5$  and  $\epsilon_{r2}=3.5$  each occupy one half of the space between the plates of area  $2\text{m}^2$  and  $d=10^{-3}\text{m}$
3. Derive the electrostatic boundary conditions at the interface between two dielectrics and a conductor to dielectric medium.
4. Derive an expression for Electric field intensity due to a line charge which has a uniform linear charge density of  $\rho_L$  C/m. Also extend it to a conductor of infinite length.

### Unit III

1. Derive the magneto static boundary conditions.
2. Derive an expression for force on a current carrying element and force between two current carrying elements.
3. Obtain the expression for inductance and torque on a long solenoid coil.
4. Derive Biot-savart's Law and Ampere's Law from concept of magnetic vector potential.
5. Derive an expression for the magnetic field intensity at a point P in a medium of permeability  $\mu$  due to an infinitely long current carrying conductor at a distance  $r$  meters from the point.

### Unit IV

1. Explain a) Transformer emf b) Generator emf.
2. Derive an expression for displacement current density
3. State Maxwell's equation in both point and integral form for conducting medium and free space.
4. By means of simple RLC series circuit, Explain the relationship between the field theory and circuit theory. Also explain the limitations of the circuit theory.
5. Obtain the expression for energy stored in the magnetic field and also derive the expression for magnetic energy density.
6. a) Explain the concept of emf induction in static and time varying magnetic field. T2 306-313  
b) In a material for which  $\sigma=5.0$  s/m and  $\epsilon_r=1$  with  $E=250\sin 10^{10}t$  (V/m). Find  $J_c$  and  $J_d$  and also the frequency at which they equal magnitudes.

### Unit V

1. How is power flow referred by using Poynting vector? Explain Poynting's theorem. Explain its significance.
2. Define Brewster angle and derive its expression.
3. Obtain the electromagnetic wave equation for free space in terms of magnetic field  $T$ .
4. A 6580mhz uniform plane wave is propagating in a material medium of  $\epsilon_r=2.25$ . If the amplitude of the electric field intensity of lossless medium is 500v/m. calculate the phase constant, propagation constant, velocity, wavelength and intrinsic impedance.
5. An EM wave travels in free space with the electric field component  $E=100 e^{j(0.866y+0.5z)}$  ax V/m. Determine a) $\omega$  and  $\lambda$  b) The magnetic field component c)The time average power in the wave.
6. Obtain the electromagnetic wave equation for conducting and perfect dielectric medium.

**Questions Are Expected for University Exams This May or may Not Be Asked for Exams**

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