

Code No: R22042

**R10****SET - 1****II B. Tech II Semester Supplementary Examinations, November - 2018**  
**ELECTRO MAGNETIC WAVES AND TRANSMISSION LINES**

(Com. to ECE, EIE)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions  
All Questions carry **Equal** Marks  
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1. a) Derive the expression for electric field intensity **E** considering the surface charge distribution of charge density  $\rho_s$ . [8M]  
b) The point charges  $-2\text{nC}$ ,  $6\text{nC}$ , and  $10\text{nC}$  are located at  $(0,0,0)$ ,  $(0,1,0)$  and  $(1,0,0)$  respectively. Find the energy in the system. [7M]
2. a) State and prove the Biot-savart's law. [8M]  
b) If the magnetic field is  $\mathbf{H} = 0.01/\mu_0 \mathbf{a}_x$  A/m, what is the force on a charge of  $1.0 \text{ pC}$  moving with a velocity of  $10^6 \mathbf{a}_x$  m/s. [7M]
3. a) Derive the Boundary conditions for the tangential and normal components of Electric fields at the Dielectric-Conductor interface. [8M]  
b) Show that the displacement current in the dielectric of parallel-plate capacitor is equal to the conductor current in its leads. [7M]
4. a) What is meant by Polarization of a wave? Explain. [7M]  
b) Discuss about the wave propagation in dielectrics and derive the expression for intrinsic impedance of a good dielectric. [8M]
5. a) Explain the reflection of uniform plane waves with normal incidence at a plane conductor boundary. [8M]  
b) An EM wave in free space is incident normally on a dielectric whose  $\epsilon_r = 7.0$ . Find the Reflection and Transmission coefficients. [7M]
6. a) Derive the expression for cutoff frequency of a parallel plane waveguide. [7M]  
b) A parallel plate waveguide made of two perfectly conducting infinite planes spaced  $5\text{cm}$  apart in air operates at a frequency of  $5\text{GHz}$ . Find the maximum time average power that can be propagated per unit width of the guide for  $\text{TE}_{10}$  and  $\text{TM}_{10}$  modes. [8M]
7. a) Define the primary constants of a transmission line and derive the expression for input impedance at any point. [8M]  
b) The characteristic impedance of  $1 \text{ KM}$  long line is  $150\Omega$  and is terminated in  $250\Omega$ . It is fed with  $5\text{V}$  having a source resistance of  $50\Omega$  at  $\omega = 0.3 \text{ rad/sec}$ . Find the input voltage and current. [7M]
8. a) Discuss about the applications of smith chart. [7M]  
b) Define the reflection coefficient and derive the expressions for i/p impedance in terms of reflection coefficient and VSWR. [8M]