

Code :RA07A31001

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**II B.Tech I Semester(R09) Supplementary Examinations, May 2011**  
**ELECTROMAGNETIC WAVES & TRANSMISSION LINES**  
 (Electronics & Instrumentation Engineering)

(For students of R07 regulation readmitted to II B.Tech I Semester R09)

Time: 3 hours

Max Marks: 70

**Answer any FIVE questions**  
**All questions carry equal marks**  
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1. (a) Define potential gradient and list out salient features of potential difference.  
 (b) An electric dipole,  $1.0 \mu\text{C-m}$  is located at  $(0, 0, 0)$ . Find out the potential at  $(1, \frac{\pi}{4}, \frac{\pi}{2})$ .
2. (a) Define magnetic dipole moment and mention its units.  
 (b) A magnetic material has  $\mu_r = 10/\pi$ , is in a magnetic field of strength,  $\mathbf{H} = 5\rho^3 \mathbf{a}_\phi \text{ A/m}$ . Find magnetization.
3. (a) Write Maxwell's equations for static fields and explain.  
 (b) In free space,  $\mathbf{D} = 5.0 \sin(\omega t + \beta z) \mathbf{a}_x$ . Find  $\mathbf{B}$  using Maxwell's equations.
4. (a) State Poynting theorem and prove it.  
 (b) The magnetic field,  $\mathbf{H}$  of a plane wave has a magnitude of  $5 \text{ mA/m}$  in a medium defined by  $\epsilon_r = 4, \mu_r = 1$ .  
     i. Determine the average power flow.  
     ii. The maximum energy density in the plane wave.
5. (a) Explain the wave propagation characteristics in good dielectrics.  
 (b) Starting from field equation, derive plane wave equation.
6. (a) What is dominant in rectangular wave guide? Sketch its EM wave pattern. Draw for all the views.  
 (b) A hollow rectangular waveguide operates at frequency =  $1 \text{ GHz}$  and it has the dimensions of  $5 \times 2 \text{ cm}$ . Check whether  $\text{TE}_{21}$  mode propagates or not?
7. (a) What is the difference between lumped parameters and distributed parameters? Discuss in detail.  
 (b) Calculate the characteristic impedance, the attenuation constant and phase constant of a transmission line if the following measurements have been made on the line  $Z_{OC} = 550\Omega$  and  $Z_{SC} = 660\Omega$ .
8. A line  $10 \text{ km}$  long has the following constants  $Z_0 = 600 \Omega$ ,  $\alpha = 0.1 \text{ nepers/km}$ ,  $\beta = 0.05 \text{ rad/km}$ . Find the received current when  $20 \text{ mA}$  are sent into one end and receiving end is short circuited. By what angle received current lags with respect to current sent?

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