

Code No: 07A31001

R07**Set No. 2**

II B.Tech I Semester Examinations, November 2010
ELECTROMAGNETIC WAVES AND TRANSMISSION LINES
Electronics And Instrumentation Engineering

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. What is a rectangular wave guide? Derive the field expressions for TEm,n mode subject to the boundary conditions imposed by geometry of the wave guide. [16]
2. (a) Obtain an expression for the energy density in the field of a solenoid.
 (b) Find the energy stored per unit length in the internal magnetic field of an infinite long straight wire of radii 2 mm carrying uniform current 10 A. [8+8]
3. (a) Prove that the field given by $E = x^2 a_x + x a_y$ can not arise from a static distribution of charge.
 (b) Show that the power density corresponding to the field $E = a_x \cos(\beta z - \omega t) + a_y \sin(\beta z - \omega t)$ is constant everywhere. [8+8]
4. (a) If $\epsilon_r = 9$, $\mu = \mu_0$, for the medium in which a wave with a frequency, $f = 0.3$ GHz is propagating, determine propagation constant and intrinsic impedance of the medium when $\sigma = 0$.
 (b) The wavelength of x-directed plane wave in a loss less medium is 0.25 m and the velocity of propagation is 1.5×10^{10} cm/s. The wave has z-directed electric field with an amplitude equal to 10 V/m. Find the frequency and permittivity of the medium. The medium has $\mu = \mu_0$. [8+8]
5. (a) Derive the wave equations in free space?
 (b) Deduce the two conditions for which a wave travelling from one medium to the other will have no total internal effects. [8+8]
6. (a) Derive an expression for the capacitance of a parallel plate capacitor of n dielectric slabs.
 (b) A parallel plate capacitor has conducting plates of area equal to 0.04 m^2 and the plates are separated by a dielectric material whose $\epsilon_r = 2$ with the plate separation of 1 cm. Find [8+8]
 - i. its capacitance value
 - ii. the charge on the plates when a potential difference of 10 V is applied
 - iii. the energy stored.
7. Explain about the parameters of the open wire line at high frequencies? [16]
8. (a) List out the applications of transmission lines.

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- (b) Find the characteristic impedance of a line at 1600Hz if the following measurements have been made on the line at 1600Hz, $Z_{OC} = 750\Omega$ and $Z_{SC} = 500\Omega$. [8+8]

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6. (a) Derive the wave equations in free space?
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7. (a) If $\epsilon_r = 9$, $\mu = \mu_0$, for the medium in which a wave with a frequency, $f = 0.3$ GHz is propagating, determine propagation constant and intrinsic impedance of the medium when $\sigma = 0$.
 (b) The wavelength of x-directed plane wave in a loss less medium is 0.25 m and the velocity of propagation is $1.5 \times 10^{10} \text{ cm/s}$. The wave has z-directed electric field with an amplitude equal to 10 V/m. Find the frequency and permittivity of the medium. The medium has $\mu = \mu_0$. [8+8]

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8. Explain about the parameters of the open wire line at high frequencies? [16]

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- (b) Deduce the two conditions for which a wave travelling from one medium to the other will have no total internal effects. [8+8]

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