Code No: R05220404 **R05** **Set No. 2**

II B.Tech II Semester Examinations,December 2010
EM WAVES AND TRANSMISSION LINES
Common to Electronics And Telematics, Electronics And Communication Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Derive the expressions for the E and H field components for TM waves in a parallel plane wave guide, using Maxwell's equations approach. [16]

2. (a) Find magnetic field strength, H, on the Z- axis at a point P(0,0,h), due to a current carrying circular loop, $x^2 + y^2 = A^2$ in Z=0 plane.
   (b) Find the total magnetic flux crossing a surface, $\phi = \frac{\pi}{2},\ 1 \leq \rho \leq 2$ *and* $0 \leq Z \leq 5$ due to a vector magnetic potential $\overline{A} = (-\rho^2/4).\widehat{z}$ webers/m. [8+8]

3. (a) For any uniform transmission line for which R, L, C and G per unit length are Independent of position along the line. Show that the variation along the line of V and I Can always be represented by the exponential law.
   (b) Derive an expression for the inductance and capacitance per unit length of coaxial transmission line. [8+8]

4. (a) Write down Maxwell's equations in their general integral form. Derive the corresponding equations for fields varying harmonically with time
   (b) In free space $D = D_m \sin(\omega t + \beta z)\ a_x$ use Maxwell's equations to find B. [8+8]

5. An EM wave in dielectric medium 1 (ε_1, μ_0) impinges obliquely on a boundary plane with dielectric medium 2 (ε_2, μ_0). Let θ_1, θ_t denote the incident and refraction angles respectively and show that for perpendicular polarization, reflection coefficient is equal to

   $\frac{\sin(\theta_t - \theta_i)}{\sin(\theta_t + \theta_i)}$ and transmission coefficient is $\frac{2 \sin\theta_t \cos\theta_i}{\sin(\theta_i + \theta_t)}$ [16]

6. (a) Apply Gauss's law to obtain expressions for electric field strength on a Gaussian surface of radius ρ in a co-axial cable of inner and outer radii, 'a' and 'b' respectively, for $\rho \leq a\, and\, a \leq \rho \leq b$. Hence deduce expressions for voltage between the two conductors.
   (b) Find the electric field due to an infinitesimally small electric dipole assuming only far fields existing. [8+8]

7. (a) An open wire transmission line having $Z_0 = 500, -12^0\Omega$ is terminated in Z_0 at the receiving end. If this line is supplied from a source of internal resistance 300Ω, calculate the reflection factor and reflection loss at the sending end terminals.

(b) A two wire line has a characteristic impedance of 300 Ω and is to feed a 90 Ω resistor at100 MHz . A Quarter wave line is to be used as a tube, 0.6 cm in diameter. Find centre-to-centre spacing in air? [8+8]

8. (a) Derive wave equations for sinusoidal time variations.

(b) A 100v/m plane wave of frequency 300 MHz travels in an infinite, lossless medium having $\mu r = 1, \in r = 9\, \sigma = 0$ write the complete time domain experements for E and H field vectors. [8+8]

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Code No: R05220404 **R05** **Set No. 4**

II B.Tech II Semester Examinations,December 2010
EM WAVES AND TRANSMISSION LINES
Common to Electronics And Telematics, Electronics And Communication Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) An open wire transmission line having $Z_0 = 500, -12^0\Omega$ is terminated in Z_0 at the receiving end. If this line is supplied from a source of internal resistance 300Ω, calculate the reflection factor and reflection loss at the sending end terminals.
   (b) A two wire line has a characteristic impedance of 300 Ω and is to feed a 90 Ω resistor at100 MHz . A Quarter wave line is to be used as a tube, 0.6 cm in diameter. Find centre-to-centre spacing in air? [8+8]

2. (a) Find magnetic field strength, H, on the Z- axis at a point P(0,0,h), due to a current carrying circular loop, $x^2 + y^2 = A^2$ in Z=0 plane.
   (b) Find the total magnetic flux crossing a surface, $\phi = \frac{\pi}{2},\ 1 \leq \rho \leq 2\ and$ $0 \leq Z \leq 5$ due to a vector magnetic potential $\overline{A} = (-\rho^2/4).\widehat{z}$ webers/m. [8+8]

3. (a) For any uniform transmission line for which R, L, C and G per unit length are Independent of position along the line. Show that the variation along the line of V and I Can always be represented by the exponential law.
   (b) Derive an expression for the inductance and capacitance per unit length of coaxial transmission line. [8+8]

4. (a) Write down Maxwell's equations in their general integral form. Derive the corresponding equations for fields varying harmonically with time
   (b) In free space $D = D_m \sin(\omega t + \beta z)\ a_x$ use Maxwell's equations to find B. [8+8]

5. (a) Derive wave equations for sinusoidal time variations.
   (b) A 100v/m plane wave of frequency 300 MHz travels in an infinite, lossless medium having $\mu r = 1, \in r = 9\ \sigma = 0$ write the complete time domain experements for E and H field vectors. [8+8]

6. (a) Apply Gauss's law to obtain expressions for electric field strength on a Gaussian surface of radius ρ in a co-axial cable of inner and outer radii, 'a' and 'b' respectively, for $\rho \leq a\, and\, a \leq \rho \leq b$. Hence deduce expressions for voltage between the two conductors.
   (b) Find the electric field due to an infinitesimally small electric dipole assuming only far fields existing. [8+8]

7. Derive the expressions for the E and H field components for TM waves in a parallel plane wave guide, using Maxwell's equations approach. [16]

8. An EM wave in dielectric medium 1 (ε_1, μ_0) impinges obliquely on a boundary plane with dielectric medium 2 (ε_2, μ_0). Let θ_1, θ_t denote the incident and refraction angles respectively and show that for perpendicular polarization, reflection coefficient is equal to

$\frac{\sin(\theta_t - \theta_i)}{\sin(\theta_t + \theta_i)}$ and transmission coefficient is $\frac{2 \sin\theta_t \cos\theta_i}{\sin(\theta_i + \theta_t)}$ [16]

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Code No: R05220404 **R05** **Set No. 1**

II B.Tech II Semester Examinations,December 2010
EM WAVES AND TRANSMISSION LINES
Common to Electronics And Telematics, Electronics And Communication Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Write down Maxwell's equations in their general integral form. Derive the corresponding equations for fields varying harmonically with time
   (b) In free space D = D_m sin ($\omega t + \beta z$) a_x use Maxwell's equations to find B. [8+8]
2. (a) Find magnetic field strength, H, on the Z- axis at a point P(0,0,h), due to a current carrying circular loop, $x^2 + y^2 = A^2$ in Z=0 plane.
   (b) Find the total magnetic flux crossing a surface, $\phi = \frac{\pi}{2},\ 1 \leq \rho \leq 2$ *and* $0 \leq Z \leq 5$ due to a vector magnetic potential $\overline{A} = (-\rho^2/4).\widehat{z}$ webers/m. [8+8]
3. (a) An open wire transmission line having $Z_0 = 500, -12^0\Omega$ is terminated in Z_0 at the receiving end. If this line is supplied from a source of internal resistance 300Ω, calculate the reflection factor and reflection loss at the sending end terminals.
   (b) A two wire line has a characteristic impedance of 300 Ω and is to feed a 90 Ω resistor at100 MHz . A Quarter wave line is to be used as a tube, 0.6 cm in diameter. Find centre-to-centre spacing in air? [8+8]
4. Derive the expressions for the E and H field components for TM waves in a parallel plane wave guide, using Maxwell's equations approach. [16]
5. (a) Derive wave equations for sinusoidal time variations.
   (b) A 100v/m plane wave of frequency 300 MHz travels in an infinite, lossless medium having $\mu r = 1, \in r = 9\ \sigma = 0$ write the complete time domain experements for E and H field vectors. [8+8]
6. An EM wave in dielectric medium 1 (ε_1, μ_0) impinges obliquely on a boundary plane with dielectric medium 2 (ε_2, μ_0). Let θ_1, θ_t denote the incident and refraction angles respectively and show that for perpendicular polarization, reflection coefficient is equal to

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7. (a) For any uniform transmission line for which R, L, C and G per unit length are Independent of position along the line. Show that the variation along the line of V and I Can always be represented by the exponential law.

(b) Derive an expression for the inductance and capacitance per unit length of coaxial transmission line. [8+8]

8. (a) Apply Gauss's law to obtain expressions for electric field strength on a Gaussian surface of radius ρ in a co-axial cable of inner and outer radii, 'a' and 'b' respectively, for $\rho \leq a \, and \, a \leq \rho \leq b$. Hence deduce expressions for voltage between the two conductors.

(b) Find the electric field due to an infinitesimally small electric dipole assuming only far fields existing. [8+8]

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Code No: R05220404 **R05** **Set No. 3**

II B.Tech II Semester Examinations,December 2010
EM WAVES AND TRANSMISSION LINES
Common to Electronics And Telematics, Electronics And Communication Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. An EM wave in dielectric medium 1 (ε_1, μ_0) impinges obliquely on a boundary plane with dielectric medium 2 (ε_2, μ_0). Let θ_1, θ_t denote the incident and refraction angles respectively and show that for perpendicular polarization, reflection coefficient is equal to

   $\frac{\sin(\theta_t - \theta_i)}{\sin(\theta_t + \theta_i)}$ and transmission coefficient is $\frac{2\sin\theta_t \cos\theta_i}{\sin(\theta_i + \theta_t)}$ [16]

2. (a) For any uniform transmission line for which R, L, C and G per unit length are Independent of position along the line. Show that the variation along the line of V and I Can always be represented by the exponential law.
   (b) Derive an expression for the inductance and capacitance per unit length of coaxial transmission line. [8+8]

3. (a) Write down Maxwell's equations in their general integral form. Derive the corresponding equations for fields varying harmonically with time
   (b) In free space $D = D_m \sin(\omega t + \beta z)\, a_x$ use Maxwell's equations to find B. [8+8]

4. (a) Find magnetic field strength, H, on the Z- axis at a point P(0,0,h), due to a current carrying circular loop, $x^2 + y^2 = A^2$ in Z=0 plane.
   (b) Find the total magnetic flux crossing a surface, $\phi = \frac{\pi}{2},\ 1 \le \rho \le 2\ and$ $0 \le Z \le 5$ due to a vector magnetic potential $\overline{A} = (-\rho^2/4).\widehat{z}$ webers/m. [8+8]

5. (a) An open wire transmission line having $Z_0 = 500, -12^0\Omega$ is terminated in Z_0 at the receiving end. If this line is supplied from a source of internal resistance 300Ω, calculate the reflection factor and reflection loss at the sending end terminals.
   (b) A two wire line has a characteristic impedance of 300 Ω and is to feed a 90 Ω resistor at100 MHz . A Quarter wave line is to be used as a tube, 0.6 cm in diameter. Find centre-to-centre spacing in air? [8+8]

6. (a) Apply Gauss's law to obtain expressions for electric field strength on a Gaussian surface of radius ρ in a co-axial cable of inner and outer radii, 'a' and 'b' respectively, for $\rho \le a\, and\, a \le \rho \le b$. Hence deduce expressions for voltage between the two conductors.
   (b) Find the electric field due to an infinitesimally small electric dipole assuming only far fields existing. [8+8]

7. Derive the expressions for the E and H field components for TM waves in a parallel plane wave guide, using Maxwell's equations approach. [16]

8. (a) Derive wave equations for sinusoidal time variations.

   (b) A 100v/m plane wave of frequency 300 MHz travels in an infinite, lossless medium having $\mu r = 1, \in r = 9\, \sigma = 0$ write the complete time domain experements for E and H field vectors. [8+8]

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