Code No: R05211001 **R05** **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

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1. (a) State Biot- Savart law
   (b) Derive an expression for magnetic field strength, H, due to a finite filamentary conductor carrying a curent I and placed along Z- axis at a point 'P' on y-axis. Hence deduce the magnetic field strength for the length of the conductor extending from - ∞ to + ∞. [4+12]

2. (a) Prove that a line of finite length and terminated by its characteristic impedance Z_0 is equivalent to a line of infinite length.
   (b) Draw the equivalent circuit of a transmission line and explain all parameters for the cases of
      i. lossy lines,
      ii. lossless line [6+10]

3. (a) For a parallel plane wave guide having z-propagation, explain the nature of variation and sketch the variation of E and H for TM_{10} waves.
   (b) Explain the impossibility of TEM wave propagation in wave guides. [10+6]

4. (a) Explain wave propagation in a conducting medium.
   (b) A large copper conductor ($\sigma = 5.8 \times 10^7 s/m, \varepsilon r = \mu r = 1$)support a unifom plane wave at 60 Hz. Determine the ratio of conduction current to displacement current. Compute the attenuation constant, Propagation constant, intrinsic impedance, wave length and phase velocity of propagation. [8+8]

5. (a) Explain boundary conditions for dielectric - dielectric and dielectric - conductor interfaces.
   (b) Let $\mu = 3 \times 10^{-5} H/m, \in = 1.2x10^{-10} f/m$ and $\sigma = 0$ every where. If $H = 2cos(10^{10}t - \beta x)\bar{a}_z$ A/m. use Maxwells equations to find B. [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 existence of only far fields. [8+8]

7. For an incident wave under oblique incident from medium of ε_1 to medium of ε_2 with parallel polarization

(a) Define and establish the relations for the critical angle θ_C and Brewster angle θ_{Br} for non-magnetic media with neat sketches.

(b) Plot θ_C and θ_{Br} versus the ratio of $\varepsilon_1/\varepsilon_2$ [8+8]

8. (a) Derive the expression for the input impedance of an uniform transmission line Terminated with load Z_L. Hence discuss the properties of a quarter wave length and half Wavelength lines assuming the line to be loss less.

(b) Describe the construction of Smith chart and give its applications. [8+8]

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Code No: R05211001 **R05** **Set No. 4**

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

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1. (a) For a parallel plane wave guide having z-propagation, explain the nature of variation and sketch the variation of E and H for TM_{10} waves.
   (b) Explain the impossibility of TEM wave propagation in wave guides. [10+6]
2. (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 existence of only far fields. [8+8]
3. For an incident wave under oblique incident from medium of ε_1 to medium of ε_2 with parallel polarization
   (a) Define and establish the relations for the critical angle θ_C and Brewster angle θ_{Br} for non-magnetic media with neat sketches.
   (b) Plot θ_C and θ_{Br} versus the ratio of $\varepsilon_1/\varepsilon_2$ [8+8]
4. (a) Derive the expression for the input impedance of an uniform transmission line Terminated with load Z_L. Hence discuss the properties of a quarter wave length and half Wavelength lines assuming the line to be loss less.
   (b) Describe the construction of Smith chart and give its applications. [8+8]
5. (a) Explain boundary conditions for dielectric - dielectric and dielectric - conductor interfaces.
   (b) Let $\mu = 3 \times 10^{-5} H/m, \in = 1.2x10^{-10} f/m$ and $\sigma = 0$ every where. If $H = 2cos(10^{10}t - \beta x)\bar{a}_z$ A/m. use Maxwells equations to find B. [8+8]
6. (a) Prove that a line of finite length and terminated by its characteristic impedance Z_0 is equivalent to a line of infinite length.
   (b) Draw the equivalent circuit of a transmission line and explain all parameters for the cases of
      i. lossy lines,
      ii. lossless line [6+10]
7. (a) State Biot- Savart law

(b) Derive an expression for magnetic field strength, H, due to a finite filamentary conductor carrying a curent I and placed along Z- axis at a point 'P' on y-axis. Hence deduce the magnetic field strength for the length of the conductor extending from - ∞ to + ∞. [4+12]

8. (a) Explain wave propagation in a conducting medium.

(b) A large copper conductor ($\sigma = 5.8 \times 10^7 s/m, \varepsilon r = \mu r = 1$)support a unifom plane wave at 60 Hz. Determine the ratio of conduction current to displacement current. Compute the attenuation constant, Propagation constant, intrinsic impedance, wave length and phase velocity of propagation. [8+8]

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Code No: R05211001 **R05** **Set No. 1**

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

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1. (a) Prove that a line of finite length and terminated by its characteristic impedance Z_0 is equivalent to a line of infinite length.
   (b) Draw the equivalent circuit of a transmission line and explain all parameters for the cases of
      i. lossy lines,
      ii. lossless line [6+10]
2. For an incident wave under oblique incident from medium of ε_1 to medium of ε_2 with parallel polarization
   (a) Define and establish the relations for the critical angle θ_C and Brewster angle θ_{Br} for non-magnetic media with neat sketches.
   (b) Plot θ_C and θ_{Br} versus the ratio of $\varepsilon_1/\varepsilon_2$ [8+8]
3. (a) Derive the expression for the input impedance of an uniform transmission line Terminated with load Z_L. Hence discuss the properties of a quarter wave length and half Wavelength lines assuming the line to be loss less.
   (b) Describe the construction of Smith chart and give its applications. [8+8]
4. (a) Explain wave propagation in a conducting medium.
   (b) A large copper conductor ($\sigma = 5.8 \times 10^7 s/m, \varepsilon r = \mu r = 1$)support a unifom plane wave at 60 Hz. Determine the ratio of conduction current to displacement current. Compute the attenuation constant, Propagation constant, intrinsic impedance, wave length and phase velocity of propagation. [8+8]
5. (a) State Biot- Savart law
   (b) Derive an expression for magnetic field strength, H, due to a finite filamentary conductor carrying a curent I and placed along Z- axis at a point 'P' on y-axis. Hence deduce the magnetic field strength for the length of the conductor extending from $-\infty$ to $+\infty$. [4+12]
6. (a) For a parallel plane wave guide having z-propagation, explain the nature of variation and sketch the variation of E and H for TM_{10} waves.
   (b) Explain the impossibility of TEM wave propagation in wave guides. [10+6]
7. (a) Explain boundary conditions for dielectric - dielectric and dielectric - conductor interfaces.

(b) Let $\mu = 3 \times 10^{-5} H/m, \in = 1.2x10^{-10} f/m$ and $\sigma = 0$ every where. If $H = 2cos(10^{10}t - \beta x)\bar{a}_z$ A/m. use Maxwells equations to find B. [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 existence of only far fields. [8+8]

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Code No: R05211001 **R05** **Set No. 3**

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

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1. (a) State Biot- Savart law
   (b) Derive an expression for magnetic field strength, H, due to a finite filamentary conductor carrying a curent I and placed along Z- axis at a point 'P' on y-axis. Hence deduce the magnetic field strength for the length of the conductor extending from - ∞ to + ∞. [4+12]

2. (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 existence of only far fields. [8+8]

3. For an incident wave under oblique incident from medium of ε_1 to medium of ε_2 with parallel polarization
   (a) Define and establish the relations for the critical angle θ_C and Brewster angle θ_{Br} for non-magnetic media with neat sketches.
   (b) Plot θ_C and θ_{Br} versus the ratio of $\varepsilon_1/\varepsilon_2$ [8+8]

4. (a) Prove that a line of finite length and terminated by its characteristic impedance Z_0 is equivalent to a line of infinite length.
   (b) Draw the equivalent circuit of a transmission line and explain all parameters for the cases of
      i. lossy lines,
      ii. lossless line [6+10]

5. (a) Explain wave propagation in a conducting medium.
   (b) A large copper conductor ($\sigma = 5.8 \times 10^7 s/m, \varepsilon r = \mu r = 1$)support a unifom plane wave at 60 Hz. Determine the ratio of conduction current to displacement current. Compute the attenuation constant, Propagation constant, intrinsic impedance, wave length and phase velocity of propagation. [8+8]

6. (a) For a parallel plane wave guide having z-propagation, explain the nature of variation and sketch the variation of E and H for TM_{10} waves.
   (b) Explain the impossibility of TEM wave propagation in wave guides. [10+6]

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7. (a) Derive the expression for the input impedance of an uniform transmission line Terminated with load Z_L. Hence discuss the properties of a quarter wave length and half Wavelength lines assuming the line to be loss less.

   (b) Describe the construction of Smith chart and give its applications. [8+8]

8. (a) Explain boundary conditions for dielectric - dielectric and dielectric - conductor interfaces.

   (b) Let $\mu = 3 \times 10^{-5} H/m, \in = 1.2x10^{-10} f/m$ and $\sigma = 0$ every where. If $H = 2cos(10^{10}t - \beta x)\bar{a}_z$ A/m. use Maxwells equations to find B. [8+8]

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