Code No: NR/RR211002 | NR/RR | Set No. 2

II B.Tech I Semester Examinations,November 2010
ELECTRO MAGNETIC THEORY
Common to Electronics And Control Engineering, 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 and explain boundary conditions for electric fields. [8M]
   (b) Derive the expression for capacitance of two parallel plates. [8M]

2. (a) In a nonmagnetic medium, E = 50cos(10^9t - 8x) a_y + 40sin (10^9t - 8x) a_z V/m, find the dielectric constant ε_r and the corresponding H. [8M]
   (b) A conducting bar can slide freely over two conducting parallel rails. While Sliding, the bar always makes 90^0 with the rails. The starting end of the first rail is at (0, 0, 0) and the rail aligns with y-axis. The starting end of the second rail is located at (0.06m, 0, 0). The starting ends of these to rails are connected by a straight conducting wire. The velocity of the sliding bar v = 20 a_y m/s.
   Rails, connecting wire, sliding bar make a rectangular loop in the xy-plane.Calculate the induced e.m.f as a function of time in the loop due to magnetic flux density B = 0.004 cos(10^6 t - y) a_z Tesla. [8M]

3. (a) Obtain the wave equation for magnetic field H for a plane wave traveling in a conducting medium. [8M]
   (b) Assuming the conductivity and permeability of a good conducter to be constant, obtain an expression for wave length interms of frequency. [8M]

4. (a) Define and explain the significance of the term: Surface Impedance. Obtain an expression for the 'surface impedance' of a conductor. [12M]
   (b) Obtain an expression for the 'surface impedance' of a conductor. [4M]

5. (a) For a plane wave with $\mathbf{E}$ = 4 sin ($2\pi \times 10^7$ t - 0.8 x)a_z V/m. Determine the time average power carried by the wave. [8M]
   (b) Using Poynting theorem find the expression for power flow in a co axial cable. [8M]

6. (a) Obtain the expression for α,β,ν_p for a wave propagating through of a good conducting medium of a conducting medium. [8M]
   (b) A plane wave is propagating in the z-direction in a magnetic, non-conducting medium of relative permittivity=4. The E-field in the x-direction has an r.m.s value of 2mV/m.Calculate the r.m.s value of H field and its direction. [8M]

7. (a) Define Energy density and derive an expression for the same in the magnetic field interms of field quantities. [10M]

(b) Define and distinguish between the terms: magnetic induction and magnetization. [6M]

8. (a) Determine the electric field intensity E at a point '2a' along the axis perpendicular to the plane of a circular wire charged uniformly at 'q' coulombs per meter, which has a radius 'a'. [10M]

(b) Two point charges -q and +q/2 are situated at the origin and at the point (a,0,0) respectively. At what point does the electric field vanish? [6M]

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Code No: NR/RR211002 | NR/RR | Set No. 4

II B.Tech I Semester Examinations,November 2010
ELECTRO MAGNETIC THEORY
Common to Electronics And Control Engineering, 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 and explain boundary conditions for electric fields. [8M]
   (b) Derive the expression for capacitance of two parallel plates. [8M]
2. (a) Obtain the expression for α,β,ν_p for a wave propagating through of a good conducting medium of a conducting medium. [8M]
   (b) A plane wave is propagating in the z-direction in a magnetic, non-conducting medium of relative permittivity=4. The E-field in the x-direction has an r.m.s value of 2mV/m.Calculate the r.m.s value of H field and its direction. [8M]
3. (a) In a nonmagnetic medium, E = 50cos(10^9t - 8x) a_y + 40sin (10^9t - 8x) a_z V/m, find the dielectric constant ε_r and the corresponding H. [8M]
   (b) A conducting bar can slide freely over two conducting parallel rails. While Sliding, the bar always makes 90^0 with the rails. The starting end of the first rail is at (0, 0, 0) and the rail aligns with y-axis. The starting end of the second rail is located at (0.06m, 0, 0). The starting ends of these to rails are connected by a straight conducting wire. The velocity of the sliding bar v = 20 a_y m/s.
   Rails, connecting wire, sliding bar make a rectangular loop in the xy-plane.Calculate the induced e.m.f as a function of time in the loop due to magnetic flux density B = 0.004 cos(10^6 t - y) a_z Tesla. [8M]
4. (a) Define and explain the significance of the term: Surface Impedance. Obtain an expression for the 'surface impedance' of a conductor. [12M]
   (b) Obtain an expression for the 'surface impedance' of a conductor. [4M]
5. (a) Obtain the wave equation for magnetic field H for a plane wave traveling in a conducting medium. [8M]
   (b) Assuming the conductivity and permeability of a good conducter to be constant, obtain an expression for wave length interms of frequency. [8M]
6. (a) Determine the electric field intensity E at a point '2a' along the axis perpendicular to the plane of a circular wire charged uniformly at 'q' coulombs per meter, which has a radius 'a'. [10M]
   (b) Two point charges -q and +q/2 are situated at the origin and at the point (a,0,0) respectively. At what point does the electric field vanish? [6M]

7. (a) Define Energy density and derive an expression for the same in the magnetic field interms of field quantities. [10M]

   (b) Define and distinguish between the terms: magnetic induction and magnetization. [6M]

8. (a) For a plane wave with $\mathbf{E} = 4 \sin (2\pi \times 10^7 \text{ t} - 0.8 \text{ x}) a_z$ V/m. Determine the time average power carried by the wave. [8M]

   (b) Using Poynting theorem find the expression for power flow in a co axial cable. [8M]

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Code No: NR/RR211002 | NR/RR | Set No. 1

II B.Tech I Semester Examinations,November 2010
ELECTRO MAGNETIC THEORY
Common to Electronics And Control Engineering, 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 plane wave with $\mathbf{E} = 4 \sin (2\pi \times 10^7 \text{ t} - 0.8 \text{ x})\text{a}_z$ V/m. Determine the time average power carried by the wave. [8M]
   (b) Using Poynting theorem find the expression for power flow in a co axial cable. [8M]

2. (a) Define and explain the significance of the term: Surface Impedance. Obtain an expression for the 'surface impedance' of a conductor. [12M]
   (b) Obtain an expression for the 'surface impedance' of a conductor. [4M]

3. (a) Determine the electric field intensity E at a point '2a' along the axis perpendicular to the plane of a circular wire charged uniformly at 'q' coulombs per meter, which has a radius 'a'. [10M]
   (b) Two point charges -q and +q/2 are situated at the origin and at the point (a,0,0) respectively. At what point does the electric field vanish? [6M]

4. (a) Obtain the expression for α,β,ν_p for a wave propagating through of a good conducting medium of a conducting medium. [8M]
   (b) A plane wave is propagating in the z-direction in a magnetic, non-conducting medium of relative permittivity=4. The E-field in the x-direction has an r.m.s value of 2mV/m.Calculate the r.m.s value of H field and its direction. [8M]

5. (a) Obtain the wave equation for magnetic field H for a plane wave traveling in a conducting medium. [8M]
   (b) Assuming the conductivity and permeability of a good conducter to be constant, obtain an expression for wave length interms of frequency. [8M]

6. (a) State and explain boundary conditions for electric fields. [8M]
   (b) Derive the expression for capacitance of two parallel plates. [8M]

7. (a) Define Energy density and derive an expression for the same in the magnetic field interms of field quantities. [10M]
   (b) Define and distinguish between the terms: magnetic induction and magnetization. [6M]

8. (a) In a nonmagnetic medium, $\text{E} = 50\cos(10^9\text{t} - 8\text{x})\ \text{a}_y + 40\sin(10^9\text{t} - 8\text{x})\ \text{a}_z$ V/m, find the dielectric constant ε_r and the corresponding H. [8M]

(b) A conducting bar can slide freely over two conducting parallel rails. While Sliding, the bar always makes 90^0 with the rails. The starting end of the first rail is at (0, 0, 0) and the rail aligns with y-axis. The starting end of the second rail is located at (0.06m, 0, 0). The starting ends of these to rails are connected by a straight conducting wire. The velocity of the sliding bar v = 20 a_y m/s.
Rails, connecting wire, sliding bar make a rectangular loop in the xy-plane.Calculate the induced e.m.f as a function of time in the loop due to magnetic flux density B = 0.004 cos(10^6 t - y) a_z Tesla. [8M]

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Code No: NR/RR211002 | NR/RR | Set No. 3

II B.Tech I Semester Examinations,November 2010
ELECTRO MAGNETIC THEORY
Common to Electronics And Control Engineering, 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) In a nonmagnetic medium, E = 50cos(10^9t - 8x) a_y + 40sin (10^9t - 8x) a_z V/m, find the dielectric constant ε_r and the corresponding H. [8M]
   (b) A conducting bar can slide freely over two conducting parallel rails. While Sliding, the bar always makes 90^0 with the rails. The starting end of the first rail is at (0, 0, 0) and the rail aligns with y-axis. The starting end of the second rail is located at (0.06m, 0, 0). The starting ends of these to rails are connected by a straight conducting wire. The velocity of the sliding bar v = 20 a_y m/s.
   Rails, connecting wire, sliding bar make a rectangular loop in the xy-plane.Calculate the induced e.m.f as a function of time in the loop due to magnetic flux density B = 0.004 cos(10^6 t - y) a_z Tesla. [8M]

2. (a) Obtain the expression for α,β,ν_p for a wave propagating through of a good conducting medium of a conducting medium. [8M]
   (b) A plane wave is propagating in the z-direction in a magnetic, non-conducting medium of relative permittivity=4. The E-field in the x-direction has an r.m.s value of 2mV/m.Calculate the r.m.s value of H field and its direction. [8M]

3. (a) State and explain boundary conditions for electric fields. [8M]
   (b) Derive the expression for capacitance of two parallel plates. [8M]

4. (a) Obtain the wave equation for magnetic field H for a plane wave traveling in a conducting medium. [8M]
   (b) Assuming the conductivity and permeability of a good conducter to be constant, obtain an expression for wave length interms of frequency. [8M]

5. (a) Determine the electric field intensity E at a point '2a' along the axis perpendicular to the plane of a circular wire charged uniformly at 'q' coulombs per meter, which has a radius 'a'. [10M]
   (b) Two point charges -q and +q/2 are situated at the origin and at the point (a,0,0) respectively. At what point does the electric field vanish? [6M]

6. (a) For a plane wave with **E** = 4 sin (2π $\times 10^7$ t - 0.8 x)a_z V/m. Determine the time average power carried by the wave. [8M]
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7. (a) Define Energy density and derive an expression for the same in the magnetic field interms of field quantities. [10M]

   (b) Define and distinguish between the terms: magnetic induction and magnetization. [6M]

8. (a) Define and explain the significance of the term: Surface Impedance. Obtain an expression for the 'surface impedance' of a conductor. [12M]

   (b) Obtain an expression for the 'surface impedance' of a conductor. [4M]

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