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Q-671

B. E. (Fourth Semester) Examination, Dec. 2014

(Electronics & Communication Engg. Branch)

Paper : Second

(EC-402)

ELECTROMAGNETIC THEORY

Time Allowed : Three hours

Maximum Marks : 70

Note : Answer all questions. One question from each unit is compulsory. All questions carry equal marks.

Unit-I

Q (a) Express $\vec{A}$ in cartesian system. 7

$$\vec{A} = \frac{10}{r} a_r + r\cos\theta\, a_\theta + a_\phi$$

(b) State and prove Gauss's Law. 7

Or

2. (a) Derive the expression for electric field due to infinite line charge. 7

(b) Derive the expression for capacitance of a cylindrical capacitor. 7

Unit-II

3. (a) State and prove uniqueness theorem. 7

(b) Write a brief note on magnetic scalar and vector potentials. 7

Or

4. (a) State and prove Ampere's Circuital law. What is the application of this law? 7

(b) The magnetic field intensity is given in a region of space as $\bar{H} = \frac{x+2y}{z^2} a_x + \frac{2}{z} a_y$ A/m.

Find current density $\vec{J}$. 7

Unit-III

5. (a) Write Maxwell's equation for time varying fields in both differential and integral forms. 7

(b) Explain the concept of displacement current. What is displacement current density. Derive its expression. 7

Or

6. (a) State and prove Poynting theorem. 7

(b) State and prove continuity equation. Explain its significance. 7

Unit-IV

7. (a) Explain polarization of E-M wave. 7

(b) Explain the following for uniform plane waves : 7

(i) Complex permitivity

(ii) Loss tangent

(iii) Skin depth

Or

8. (a) What is propagation constant? Derive the expressions for attenuation constant and phase constant. 7

(b) Find the characteristic impedance of the medium whose relative permittivity is 4 and relative permeability is 1. 7

Unit-V

9. (a) Write short note on Frequency dispersive propagation. 7

(b) Explain Phase velocity and Group velocity. 7

Or

10. Derive Fresnel's equations for perpendicular polarization. Explain Brewster angle. 14

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P-1081

P-1081

B. E. (Fourth Semester) Examination, April-May 2014

(Electronics and Communication Engg. Branch)

Paper : Second

ELECTROMAGNETIC THEORY

Time Allowed : Three hours

Maximum Marks : 70

*Note : Answer all questions. **One** question from each unit is compulsory. All questions carry equal marks.*

Unit-I

1. (a) Prove that curl of gradient of a scalar is zero.

(b) Find the curls of the following vector field.

(i) $yz_x - xa_y$

(ii) $a\ \phi$ in cylindrical co-ordinates.

Or

2. (a) Prove that $E = -\nabla$

(b) Show that the charge enclosed in differential volume element by using Gauss's Law is

$$\Delta V = \left[\frac{\partial Dx}{\partial x} + \frac{\partial Dy}{\partial y} + \frac{\partial Dz}{\partial z}\right] \times \text{volume}$$

Unit-II

3. (a) Prove Poisson and Laplace equations starting from point of Gauss Law.

(b) State and prove the boundary conditions to be satisfied by electric field.

Or

4. (a) Write and explain Biot-Savart Law. Also write it in vector form.

(b) State and prove Ampere's Circuital law. What is the application of this law.

Unit-III

5. (a) Explain the Faraday's Law. Write the differential or point form of Faraday's Law.

(b) Write Maxwell's equations involving curl and divergence of static magnetic field and explain the physical significance.

Or

6. (a) State and prove continuity equation. Explain its significance.

(b) State and prove power and the Poynting vector.

Unit-IV

7. (a) Explain and define the polarization of wave (E-M wave).

(b) Obtain conditions for normal and oblique incidence of wave.

Or

8. (a) Explain transmission line equations.

(b) Define following terms :

(i) Complex permitivity

(ii) Loss tangent

(iii) Skin depth

Unit-V

9. (a) State and prove that the Brewster angle.

(b) Wave propagation in the Guide explain phase group velocity.

Or

10. (a) A standard air-filled rectangular wave-guide with dimension a = 8·636 cm, b = 4·318 cm is fed by a *AGHZ* carries from a coaxial cable. Determine if a TE_{10} mode will be propagated. If so calculate the phase velocity and the group velocity.

(b) Write a short note on radiation field.

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R-1291

B. E. (Fourth Semester) Examination, July 2016

(For Regular/ATKT Students)

(Electronics & Communication Engg. Branch)

Paper : Second

ELECTROMAGNETIC THEORY

Time Allowed : Three hours

Maximum Marks : 70

Note : Answer all questions. One question from each unit is compulsory. All questions carry equal marks.

Unit-I

1. (a) Transform a vector

$$\vec{A} = \frac{\sqrt{x^2 + y^2}}{\sqrt{x^2 + y^2 + z^2}}\hat{i} - \frac{yz}{\sqrt{x^2 + y^2 + z^2}}\hat{k}$$

to cylindrical co-ordinates.

(b) Derive an equation for electric field from an infinite line charge.

Or

2. (a) Find grad r^n, where r is the distance of any point (x, y, z) from the origin $(0, 0, 0)$. 7

(b) Obtain the expression of energy stored in an electrostatic field. 7

Unit-II

3. (a) State and prove uniqueness theorem. 7

(b) A circular loop located on $x^2 + y^2 = 9, z = 0$ carrying a D.C 10 amp along $\vec{a}_\phi$ determine $\vec{H}$ at (0, 0, 4). 7

Or

4. (a) Calculate B and H due to a long solenoid. 7

(b) Determine the self inductance of toroid coils. 7

Unit-III

5. (a) What do you mean by poynting vector? State for duality theorem. 7

(b) Explain in detail the concept of skin depth. 7

Or

6. (a) Derive Maxwell equation in differential and integral form. 7

(b) Derive Helmholtz wave equation and write its general solution in various co-ordinates system. 7

Unit-IV

7. (a) Given a non-magnetic material having $\epsilon_r = 2 \cdot 25$ and $\sigma = 10^{-4}$ mho s/m. Find loss tangent and attenuation constant at 2·5 MHz. 7

(b) What do you mean by polarization of wave? Explain circular and elliptic polarization. 7

Or

8. (a) Describe the reflection by a perfect conductor at oblique incidence in case of perpendicular polarization. 7

(b) Write an explanatory note on transmission line analogy. 7

Unit-V

9. (a) What is frequency dispersive propagation? Explain with suitable example. 7

(b) Write short note on retarded vector potential. 7

Or

10. (a) Explain critical and Brewster's angle? 7

(b) Describe reflection co-efficient and transmission co-efficient in case of uniform plane wave at normal incidences. 7

Reflection coefficient

$$\Rightarrow \eta = \frac{n_2 - n_1}{n_2 + n_1}$$

Transmission coefficient

$$\frac{2n_2}{n_1 + n_2}$$

P-581

B. E. (Fourth Semester) Examination,
Feb.-March 2014

(Electronics and Communication Engg. Branch)

Paper : Second

ELECTROMAGNETIC THEORY

Time Allowed : Three hours

Maximum Marks : 70

Note : Answer all questions. One question from each unit is compulsory. All questions carry equal marks.

Unit-I

1. (a) Define gradient, divergence and curl of a vector.

(b) Explain electric dipole.

Or

2. (a) State Coulomb's law and define electric field intensity and potential function

(b) Explain Laplace's and Poison's equation

Unit-II

3. (a) Give the solution of Laplace's equation in systems of dielectric and conducting boundaries.

(b) Explain parallel plane and coaxial systems.

Or

4. (a) Explain magnetic effects of current flow, magnetic flux and permeability.

(b) Define Ampere's circuital law.

Unit-III

5. (a) Define Faraday's law in integral and differential forms. Give the concept of displacement current.

(b) Give Maxwell's equation differential and integral form and give their physical interpretation.

Or

6. (a) Define Maxwell's equation for TH Field.

(b) Derive Helmholtz wave equation and give its general solution.

Unit-IV

7. (a) Define circular and elliptic polarization.

(b) Define resolution in terms of linear polarized waves.

Or

8. (a) Explain the behaviour of plane waves in good conducting and ionized media.

(b) Explain boundary conditions at perfect conductor surface.

Unit-V

9. (a) Explain refraction of plane waves at dielectric media.

(b) Define Brewster's angle and total internal reflection.

Or

10. (a) Define phase velocity and group velocity.

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(b) Explain magnetic vector potential for sources in free space

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R-845

B. E. (Fourth Semester) Examination, Jan. 2016

(For ATKT Students)

(Electronics & Communication Engg. Branch)

Paper : Second

ELECTROMAGNETIC THEORY

Time Allowed : Three hours

Maximum Marks : 70

Note : Answer all questions. One question from each unit is compulsory. All questions carry equal marks.

Unit-I

1. (a) Vectors $A = \hat{r}7 + \hat{\theta}5 + \hat{\phi}3$ and $B = \hat{r}2 + \hat{\theta}3 + \hat{\phi}4$ are situated at a point $(r, \theta, \phi) = (3, 45°, 45°)$ find

PTO

(i) $\overline{A} + \overline{B}$

(ii) $\overline{A} \cdot \overline{B}$

(iii) $\overline{A} \times \overline{B}$ 7

(b) Describe Coulomb's law. 7

Or

2. (a) Find the gradient of the following functions at the point (2, –3, –4) : 7

(i) $f(x, y, z) = x^2 + y^3 + z^4$

(ii) $f(x, y, z) = x^2 y^3 z^4$

(b) Derive Poisson's equation and Laplace's equation and discuss their significance. 7

Unit-II

3. (a) Write short note on method of images. 7

(b) Write short note on boundary conditions for magnetic field. 7

Or

4. (a) State and explain Biot-Savart's law. 7

(b) State and prove uniquence theorem. 7

Unit-III

5. (a) Explain displacement current in detail. 7

(b) State and prove poynting vector theorem. 7

Or

6. (a) Derive the wave equation in source free region. 7

(b) Derive Maxwell's equation in differential and integral form. 7

Unit-IV

7. (a) How the plane wave propagation in a lossy medium is achieved. 7

(b) Explain skin depth in detail. 7

Or

8. (a) Describe the propagation of wave in ionized media. 7

(b) Explain polarization of wave (E-M wave). 7

Unit-V

9. Write short notes on : (any two) 7+7

(i) Critical and Brewster's angle

(ii) Group and phase velocity

(iii) Magnetic vector potential and retarted potential