Code: 15A02403

R15

B.Tech II Year II Semester (R15) Supplementary Examinations December 2018

ELECTROMAGNETIC FIELDS

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Find the force in Newton on charge $Q_1 = 20\ \mu C$ situated at (0, 1, 2) m due to charge $Q_2 = -300\ \mu C$ situated at (2, 0, 0) m.

(b) State Gauss law.

(c) Define dielectric strength of a material mention the same for air.

(d) Define electric field intensity

(e) Plane y = 0 carries a uniform current of 30 $\bar{a}_z\ ma/m$. Calculate the magnetic field intensity at $(1, 10, -2)$ m in rectangular co-ordinate system.

(f) State Ampere's circuital law.

(g) Define self and mutual inductance.

(h) State Laplace equation for scalar magnetic potential.

(i) State Poynting theorem.

(j) Write the wave equation in lossy dielectric.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 A circular disc of radius 'a' meter is charged uniformly with a charge density of $P_s\ c/m^2$. Find the electric field at a point 'h' m from the disc along its axis.

OR

3 Derive the expression of Poisson's equation of electrostatics.

UNIT – II

4 Derive the electrostatic boundary conditions at the interface of two dielectrics.

OR

5 Derive the expression for the capacitance between: (i) Two parallel plates. (ii) Two coaxial cylinders.

UNIT – III

6 Find an expression for magnetic field intensity around infinitely long straight conductor using Biot Savart's law.

OR

7 Explain magnetic dipole, magnetic vector potential, magnetic dipole moment and torque, deriving necessary expressions.

UNIT – IV

8 Derive the expression for the inductance of: (i) Solenoid. (ii) Toroid.

OR

9 Obtain the expression for energy stored in magnetic field of a coil possessing an inductance L when the current in the coil is 1 amp.

UNIT – V

10 Derive wave equations in phasor form and also derive for $\alpha, \beta, \gamma\ and\ \eta$.

OR

11 Derive the Maxwell's equations for field varying harmonically with time.

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(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Differentiate between point, line and volume charges.
(b) Define electric field intensity.
(c) Explain the term polarization in electric materials.
(d) What is the difference between conduction current and convection current?
(e) Explain point form of Amperes circuital law.
(f) How a magnetic dipole is formed?
(g) Write the properties of vector magnetic potential.
(h) How the self inductance of a Toroid can be measured?
(i) What is meant by dynamically induced emf?
(j) What is the significance of Poynting vector?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) State and explain Coulombs law.
(b) Derive the expression for electric filed intensity due to a volume charge.

OR

3 (a) What is meant by Gaussian surface? What are the rules to be followed while selecting Gaussian surface.
(b) Determine the electric flux density in a region about a uniform line charge of 10nC/m lying along X axis in free space.

UNIT – II

4 (a) Explain how electric dipoles are formed. Define the term polarization.
(b) Define current density. Obtain Ohms law in point form.

OR

5 (a) What is meant by boundary condition? What is the importance of considering boundary conditions at the boundary of two materials?
(b) Explain how to calculate capacitance of a co-axial capacitor.

UNIT – III

6 (a) State and explain Biot Savart law.
(b) Determine magnetic field intensity produced by Solenoid current carrying wire.

OR

7 (a) State and explain Ampere's law in point form.
(b) Derive the expression for force on a charged particle moving between two straight parallel current carrying conductors.

UNIT – IV

8 (a) Define and explain the difference between the terms scalar and vector magnetic potentials.
(b) Derive the Vector Poisson's equation.

OR

9 Determine the self inductance and mutual inductance between two co-axial Solenoids of radius R_1 and R_2, $R_2 > R_1$ carrying currents I_1 and I_2 with n_1 and n_2 turns/m respectively.

UNIT – V

10 (a) Derive the expression for displacement current.
(b) Explain the Maxwell's equations in point and integrals forms.

OR

11 (a) State and explain Poynting theorem.
(b) Derive the expression for wave propagation in free space. How the wave equation will be modified for conducting and insulating materials?

*****

Code: 15A02403

R15

B.Tech II Year II Semester (R15) Supplementary Examinations December 2017

ELECTROMAGNETIC FIELDS

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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Code: 15A02403

R15

B.Tech II Year II Semester (R15) Regular Examinations May/June 2017

ELECTROMAGNETIC FIELDS

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART - A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Define electrified intensity and develop relationship with force and charge.

(b) Write Maxwell's equation in electrostatic field in point forces and explain the terms.

(c) What is meant by equipotential surface? Explain.

(d) Explain what is meant by point form of Ohm's law.

(e) Distinguish between Poisson's and Laplace equations in electrostatic fields.

(f) "Magnetostatic field is not conservative". Explain.

(g) Is it possible to have isolated magnetic charges? Explain.

(h) Discuss about Maxwell's equation in differential form which is obtained from Faraday's law.

(i) Explain what is meant by scalar magnetic potential.

(j) "Time varying electrostatic field is not conservative". Explain.

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

2 (a) Derive the expression for resultant force on 'n' charges using the principle of superposition.

(b) Point charges 2nc and -1nc are located at (1, 2, 1) and (-1, 1, 3) respectively. Calculate the electric force on a 5nc charge, located at (2, 3, 1) and electric field intensity at that point.

OR

3 (a) Derive the expressions for electric field intensity of a finite line charge.

(b) A finite sheet of $1 \leq x \leq 2m, 1 \leq y \leq 2m$ on the z = 0 plane has a charge density of xy. Find the charge on the sheet.

UNIT - II

4 (a) Define energy density and derive the expression for it.

(b) Three point charges 1nc, 2nc, 3nc are located at (1, 1, 1), (2, 2, 2) and (3, 3, 3) respectively. Find the energy in the system.

OR

5 (a) Describe the expression for capacitance of a spherical capacitor.

(b) Conducting spherical shells with radii of 5 cm, and 15 cm are maintained at a potential difference of 45 V. Determine V, Q, E, C.

UNIT - III

6 Derive the expression for magnetic field intensity of an infinitely long coaxial transmission line.

OR

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

(b) Given magnetic vector potential $-\frac{\rho}{2}az\ wb/m$, calculate the total magnetic flux density crossing the surface $\phi = \frac{\pi}{2},\ 2 \leq \rho \leq 3m,\ 1 \leq z \leq 2m.$

Contd. in page 2

UNIT - IV

8 (a) Determine the expression for self inductance of a coaxial cable of inner and outer radii a and b respectively.

(b) Write Maxwell's equation for static electromagnetic fields is differential and integral forms and describe.

OR

9 (a) Develop the Lorentz force equations.

(b) Define and distinguish between magnetic dipole and dipole moment, deriving necessary expressions.

UNIT - V

10 (a) Show that net power flowing out of a given volume is equal to the time rate of decrease in energy stored within the volume without conduction losses.

(b) Explain what is meant by displacement current deriving necessary expressions.

OR

11 (a) Explain what is meant by intrinsic impedance of a medium and derive the necessary expressions for the same.

(b) Derive the expressions for wave equations in electric field in free space.

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