Reg. No. :

Question Paper Code : X67583

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Third Semester
Electrical and Electronics Engineering
EE1201A – ELECTROMAGNETIC THEORY
(Regulations 2008)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Mention the sources of electromagnetic fields.

2. State the physical significance of curl of a vector field.

3. Determine the electric field intensity at any point between two infinite sheets of charge densities + $\rho s C/m^2$.

4. Distinguish between dielectric constant and dielectric strength.

5. State Biot-Savart law.

6. What is Magnetic Flux density ?

7. What type of voltage is induced in a loop, which is rotating about the y-axis in a magnetic field of flux density $\vec{B} = B_0 \, Sin(\omega t)\hat{i}$ Tesla ?

8. Write the relation showing, the energy required to establish a magnetic field by a quasi stationary current system.

9. State the Poynting theorem.

10. Mention any two properties of uniform plane wave.

PART – B **(5×16=80 Marks)**

11. a) i) Describe how the differential elements in length, area and volume are defined in various orthogonal coordinate systems. **(12)**

ii) State the fundamental properties of the gradient of a scalar field. **(4)**

(OR)

b) i) Describe the effects of electromagnetic fields. **(6)**

ii) Explain the curl of a vector field and Stokes's theorem. **(10)**

12. a) i) Determine the electric field intensity $\vec{E}$ at a point '2a' along the axis perpendicular to the plane of a circular wire charged uniformly at ρ_1 C/m which has a radius 'a'. **(6)**

ii) Derive the electrostatic boundary conditions at the interface between two dielectrics. **(10)**

(OR)

b) i) Determine the electrostatic potential.

1) Inside and outside a spherical shell of radius R. The shell contains a total charge Q uniformly distributed over the surface.

2) Inside and outside a spherical shell of radius R_1. The shell contains a total charge Q_t, uniformly distributed throughout the volume.

Plot the variation of potential with respect to the radial distance in both cases. **(4+8)**

ii) An air condenser consisting of two parallel square plates of 50 cm side is charged to a potential difference of 250 V. When the plates are 1 mm apart. Find the work done in separating the plates from 1 mm to 3 mm. Assume perfect insulation. **(4)**

13. a) i) Discuss about the magnetic field in multiple media. **(8)**

ii) Discuss about magnetic materials. **(8)**

(OR)

b) i) Derive the Energy density of Inductance. **(8)**

ii) Derive the Magnetic field due to circular loop. **(8)**

14. a) i) Explain briefly about 'Transformer and Motional EMFs'. **(6)**

ii) By applying field theory to a RLC parallel circuit excited by an alternating current source of 'I' ampere, show that $I = \frac{V}{R} + \frac{1}{L}\int V dt + C\frac{dV}{dt}$ Where, V = voltage across parallel combination, R = resistance of resistor, L = inductance of inductor, C = capacitance of capacitor. **(10)**

(OR)

b) Write down and explain the Maxwell's equations in integral and differential forms for the following cases.

i) General case **(3)**

ii) Free space **(3)**

iii) Harmonic variation **(4)**

iv) Static case **(3)**

v) Steady case. **(3)**

15. a) i) Deduce the equation of the propagation of the plane electromagnetic waves in free space. **(8)**

ii) An air line has characteristic impedance of 70 Ω and phase constant of 3 radians/m at 100 MHz. Calculate the inductance/meter and the capacitance/meter of the line. **(8)**

(OR)

b) i) Derive the Poynting theorem and give its significance. **(12)**

ii) Describe briefly about Reflection coefficient and Transmission coefficient. **(4)**

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