

II B.Tech I Semester (R18) Regular Examinations November 2019
ELECTRO MAGNETIC FIELDS

Time : 3 hours

Max. Marks: 70

PART- A

(Compulsory Question 10 X 2 = 20M)

- 1 a Define electric field intensity.
- b Find the force in newton between charges 2C and -1C separated by a distance 1m in air.
- c Write the difference between Laplace's and Poisson's equations
- d Classify capacitances in electro static fields.
- e What is Equation of continuity?
- f Differentiate Biot-Savart's law and Ampere's law
- g Define vector magnetic potential?
- h Define Lorentz force equation.
- i What is the significance of Poynting vector?
- j Write Maxwell second equation for free space.

PART- B

(Answer all the questions, Each carry 10M)

- 2 a State and prove Maxwell's first equation.
 - b Find the electric field intensity, flux density and volume charge density at a point (1, 0, 1) if the given potential is $V = 3x^2y + 2yz^2 + 2xyz$ volt.
- (OR)
- 3 a Obtain the expression for electric potential due to an electric dipole?
 - b A charge $Q_2=121\text{nC}$ is located in vacuum at $P_2(-0.03, 0.01, 0.04)\text{m}$. Find the force on Q_2 due to $Q_1=110\ \mu\text{C}$ at $P_1(0.03, 0.08, -0.02)\text{m}$.
- 4 a Obtain the boundary condition at the interface of a conductor and dielectric.
 - b Explain how to calculate capacitance of a parallel plate capacitor.
- (OR)
- 5 a Define current density. Obtain Ohms law in point form.
 - b Find the capacitance per unit length of a coaxial cable of inner radius R_1 and outer radius R_2 ?
- 6 a State and explain Ampere's law in point form.
 - b Derive the expression for magnetic field intensity (H) due to infinitely long straight conductor using Biot-Savart's law.
- (OR)
- 7 a Determine magnetic field intensity produced by Solenoid current carrying wire.
 - b Derive the Maxwell's second equation $\text{div}(\mathbf{B})=0$.
- 8 a Determine self inductance of a solenoid.
 - b Compare self and mutual Inductances and also derive the relation between self, mutual inductance and coupling co-efficient in a magnetic field?
- 9 a Derive expression for energy stored and energy density in a magnetic field.
 - b A uniform solenoid 100 mm in diameter and 400mm long has 100 turns of wire and a current of 3 amps. Find the inductance of the solenoid with $\mu_r=50$.
- 10 a Obtain the Differential form of Faraday's Laws of electromagnetic induction.
 - b List all the Maxwell's equations in differential and integral forms for static fields and time varying fields.
- (OR)
- 11 a Explain the concept of displacement current.
 - b State and prove Poynting theorem?