Reg. No.												

Question Paper Code	12423

B.E. / B.Tech - DEGREE EXAMINATIONS, NOV / DEC 2023

Third Semester

Electrical and Electronics Engineering

20EEPC303 - ELECTROMAGNETIC THEORY

(Regulations 2020)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	List the sources of electromagnetic fields.	*2,K1,CO1*
2.	Define divergence and its physical meaning.	*2,K1,CO1*
3.	Demonstrate the boundary conditions between two dielectric media.	*2,K2,CO2*
4.	Give the significant physical differences between Poisson's and Laplace's equations.	*2,K2,CO2*
5.	State Ampere's circuital law.	*2,K1,CO3*
6.	Distinguish between magnetic scalar potential and magnetic vector potential.	*2,K1,CO3*
7.	Define reluctance and permeability.	*2,K1,CO4*
8.	Write down the Maxwell's equation from electric gauss's law in integral and point forms.	*2,K2,CO4*
9.	Mention the properties of uniform plane wave.	*2,K1,CO5*
10.	Develop the values of velocity and intrinsic impedance for free space.	*2,K2,CO5*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	(i) State and prove Coulomb's Law.	*6,K2,CO1*
		(ii) Explain the divergence of a vector field and Divergence theorem.	*7,K2,CO1*
		OR	
	b)	By means of Gauss's law. Determine the electric field intensity at a point 'P' distance 'h' m from an infinite line of uniform charge with the charge density of 'λ' C/m length.	*13,K2,CO1*
12.	a)	Derive the expression for the capacitance of a parallel plate capacitor with two different dielectric materials in tangential and normal manner.	*13,K2,CO2*
		OR	

b) A capacitor consists of squared two metal plates each 100 cm side placed parallel and 2 mm apart. The space between the plates is filled with a dielectric having a relative permittivity of 3.5. A potential drop of 500V is maintained between the plates. Evaluate (i) capacitance, (ii) charge of the capacitor, (iii) electric flux density, (iv) potential gradient. *13,K2,CO2*

13. a) Obtain the expression for energy stored in the magnetic field and also derive the expression for magnetic energy density. *13,K2,CO3*

OR

b) (i) Derive the expression for the magnetic field intensity inside and outside a co- axial conductor of inner radius 'a' and outer radius 'b' and carrying a current of 'I' amperes in the inner and outer conductor. *7,K2,CO3*

(ii) Calculate the self-inductance of infinitely long solenoid. *6,K2,CO3*

14. a) State and derive the Maxwell's equations for free space in integral form and point form for time varying field. *13,K3,CO4*

OR

b) (i) An iron ring with a cross-sectional area of 3 cm*cm and a mean circumference of 15 cm is wound with 250 turns of wire carrying a current of 0.3A. The relative permeability of the ring is 1500. Calculate the flux established in the ring. *6,K2,CO4*

(ii) Explore the relationship between circuit theory and field theory in terms of series RLC circuit. *7,K2,CO4*

15. a) State Poynting theorem and thus obtain an expression for instantaneous power density vector associated with electromagnetic field. *13,K3,CO5*

OR

b) Obtain an expression for electromagnetic wave propagation in lossy dielectrics. *13,K2,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) By means of Biot-Savart's law, derive an expression for the magnetic field intensity at any point on the line through the centre at a distance 'h' from the centre and perpendicular to the plane of a circular loop of radius 'a' and carrying current 'I'. *15,K3,CO3*

OR

b) At an interface separating magnetic media, apply boundary conditions and show that the tangential component of 'H' and normal component of 'B' are continuous at the boundary. *15,K3,CO3*