

Reg. No.																			
----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Question Paper Code	12889
---------------------	-------

**B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024**

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. Show that $H = (3y^4 + z^2) a_x + 4x^3 z^2 a_y + 3x^2 y^2 a_z$ is solenoid.	2	K1	CO1
2. What is meant by Gauss law?	2	K2	CO1
3. What is meant by equipotential surface?	2	K1	CO2
4. Electric field is conservative field. Justify.	2	K2	CO2
5. Distinguish between solenoid and toroid.	2	K2	CO3
6. State Amperes circuital law.	2	K1	CO3
7. Distinguish between conduction current and displacement current.	2	K2	CO4
8. What is motional emf?	2	K1	CO4
9. Mention the properties of uniform plane wave.	2	K2	CO5
10. Define skin depth.	2	K2	CO5

**PART - B (5 × 13 = 65 Marks)**

Answer ALL Questions

11. a) Write short notes on			
i) Gradient	3	K2	CO1
ii) Divergence	3	K2	CO1
iii) Curl	3	K2	CO1
iv) Divergence theorem	4	K2	CO1

**OR**

b) Derive an expression for electric field intensity due to an infinite long straight conductor from its principles.	13	K2	CO1
12. a) Find the potential at any point along the axis of a uniformly charged circular disc of ' $\sigma$ ' C/m <sup>2</sup> . The disc has radius of 'a' m.	13	K2	CO2

**OR**

b) i) Deduce an expression for the capacitance of a parallel plate capacitor having two dielectric media in tangential manner.	8	K2	CO2
ii) Derive Poisson's and Laplace's equation.	5	K2	CO2

13. a) Obtain an expression for the magnetic field intensity due to straight finite conductor carrying current 'I' amperes using Biot Savart's law. 13 K2 CO3

**OR**

- b) Derive the expressions for boundary conditions in magnetic fields. 13 K2 CO3

14. a) With necessary explanation, derive the Maxwell's equation in point and integral form. 13 K2 CO4

**OR**

- b) i) Write short notes on Faraday's law of electromagnetic induction. 6 K2 CO4  
ii) Explain the relation between field theory and circuit theory. 7 K2 CO4

15. a) State Poynting theorem and derive an expression for Poynting theorem. 13 K2 CO5

**OR**

- b) A 6580 MHz uniform plane wave is propagating in a material medium of  $\epsilon_r = 2.25$ . If the amplitude of the electric field intensity of lossless medium is 500V/m. Calculate the phase constant, propagation constant, velocity, wave length and intrinsic impedance. 13 K2 CO5

**PART - C (1× 15 = 15 Marks)**

16. a) Check the validity of the divergence theorem considering the field  $D = 2xy \mathbf{a}_x + x^2 \mathbf{a}_y$  C/m<sup>2</sup> and rectangular parallelepiped formed by the planes  $x=0, x=1; y=0, y=2; z=0, z=3$ . 15 K3 CO1

**OR**

- b) Verify Stokes theorem for the vector field , 15 K3 CO1  
 $\vec{F} = r^2 \cos \phi \vec{a}_r + Z \sin \phi \vec{a}_z$  around the path defined by  $0 \leq r \leq 3$ ,  
 $0 \leq \phi \leq 45^\circ, Z=0$ .