Q. Code: 113383

Reg. No. | | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Third Semester

EE22303 – ELECTROMAGNETIC THEORY

(Electrical and Electronics Engineering)

(Regulation 2022)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Apply basic mathematical concepts to solve electromagnetic vectors in orthogonal coordinate system.	**4**
CO 2	Interpret and solve the problems related to electrostatics.	**4**
CO 3	Apply the electrostatic principles to compute the boundary value problems and analyze Electric field in material space.	**4**
CO 4	Analyze and solve the problems related to magneto-statics.	**4**
CO 5	Solve time-varying fields using Maxwell's equation and Electromagnetic wave equation.	**4**

PART- A (20 x 2 = 40 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	When a vector field is solenoidal and irrotational ?	**1**	**2**
2.	Write expression for differential length in cylindrical and spherical co-ordinates.	**1**	**2**
3.	Verify that the vectors $\bar{A}=4\hat{a}_x-2\hat{a}_y+2\hat{a}_z$ and $\bar{B}=-6\hat{a}_x+3\hat{a}_y-3\hat{a}_z$ are parallel to each other.	**1**	**2**
4.	State Stroke's theorem.	**1**	**2**
5.	List the applications of Gauss's law.	**2**	**2**
6.	Define Electric flux intensity.	**2**	**2**
7.	Compare uniform and non-uniform field.	**2**	**2**
8.	What is dipole?	**2**	**2**
9.	Express the boundary conditions at the interface between two perfect dielectrics	**3**	**2**
10.	Write the Poisson's equation for free space.	**3**	**2**
11.	Express the value of capacitance for a coaxial cable.	**3**	**2**
12.	Calculate the capacitance of a parallel plate capacitor having an electrode area of 100 cm^2. The distance between the electrodes is 3mm and the dielectric used has a permittivity of 3.6.	**3**	**2**
13.	Write the expression of magnetic field intensity due to infinite sheet.	**4**	**2**
14.	State Biot-Savart's law.	**4**	**2**
15.	Distinguish between circuit theory and field theory	**4**	**2**
16.	Define self and mutual inductance.	**4**	**2**
17.	List the properties of electromagnetic waves.	**5**	**2**
18.	Define the term motional EMF.	**5**	**2**
19.	Give the expression of Poynting vector.	**5**	**2**

20.	Obtain the intrinsic impedance at free space.	**5**	**2**	

PART- B (5 x 10 = 50 Marks)

		Marks	CO	RBT LEVEL
21. (a)	Express vector $\overline{B}$ in cartesian and cylindrical coordinate systems. Given $\overline{B}=\frac{10}{r}\overline{a}_r+r\cos\theta\overline{a}_\theta+\overline{a}_\varphi$ then $\overline{B}$ at (-3, 4, 0) and (5, $\frac{\pi}{2}$, -2)	**(10)**	**1**	**4**
	(OR)			
(b)	State and Prove that Divergence's theorem with suitable equations. Also show that divergence of a curl of a vector is zero	**(10)**	**1**	**4**
22. (a)	A circular of radius 'a' meter is charged uniformly with a charge density ρ_s c/m^2. Find the electric field at a point 'h' meter from the disc along its axis.	**(10)**	**2**	**3**
	(OR)			
(b)	Find Electric field intensity and potential at r_A = 5m with respect to r_B = 15m due to point charge Q = 500pC at the origin and zero reference at infinity.	**(10)**	**2**	**3**
23. (a)	State and prove electrostatic boundary conditions with neat diagram.	**(10)**	**3**	**4**
	(OR)			
(b)	Assess an expression for the capacitance of a parallel plate capacitor with two dielectrics of relative permittivity ε_1 and ε_2 respectively interposed between plates. Also write the expression for energy stored and energy density.	**(10)**	**3**	**4**
24. (a)	Show by means of Biot-savart's law that the flux density produced by an infinitely long straight wire carrying a current 'I' at any point distant 'ρ' normal to the wire is given by $\frac{\mu_0\mu_r I}{2\pi\rho}$	**(10)**	**4**	**4**
	(OR)			
(b)	Find the torque about y axis for the two conductors of length T carrying current in opposite directions separated by a fixed distance 'w' in an uniform magnetic field in x axis direction.	**(10)**	**4**	**4**
25. (a)	**(i)** Discuss about transformer and motional EMF.	**(10)**	**5**	**4**
	(ii) State and prove Poynting theorem.	**(10)**	**5**	**4**
	(OR)			
(b)	Derive the equation of the propagation of the plane electromagnetic wave in free space.	**(10)**	**5**	**4**

PART- C (1 x 10 = 10 Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	Make use of suitable law to obtain the Maxwell's equations in differential	**(10)**	**5**	**5**

and integral form.

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