

Regular & Supplementary Winter Examination-2023

Subject Code & Name: Electromagnetic Field Theory (BTETC501)

	(Level/CO)	Marks
Q. 1 Solve Any Two of the following.		12
A) Transform each of following vector to cylindrical coordinates at point specified a) $5\mathbf{U}_x$ at $P(\rho = 4, \phi = 120^\circ, z = -1)$ b) $4\mathbf{U}_x - 2\mathbf{U}_y - 4\mathbf{U}_z$ at $A(x = 2, y = 3, z = 5)$	Understand	6
B) State Divergence Theorem. Evaluate both sides of divergence theorem for the region $r \leq 1$ and if $\vec{A} = r \sin^2 \phi \cos^2 \theta \vec{a}_r$	Understand, Remember	6
C) Vectors $\mathbf{A} = 3\mathbf{U}_x + 5\mathbf{U}_y + 6\mathbf{U}_z$ and $\mathbf{B} = 6\mathbf{U}_x + 4\mathbf{U}_y + 2\mathbf{U}_z$ are situated at point $P(x, y, z)$. Find a) $\vec{A} + \vec{B}$ b) $\vec{A} \cdot \vec{B}$ c) $\vec{A} \times \vec{B}$ d) angle between $\vec{A}$ and $\vec{B}$	Understand	6
Q.2 Solve Any Two of the following.		12
A) Show that Magnetic Field Intensity at any point due to finite conductor carrying current I placed along Z axis is $\vec{H} = \frac{I}{4\rho\pi} (\sin \alpha_2 - \sin \alpha_1) \vec{a}_\phi$ Where α_2, α_1 are the Inclination of Upper end and Lower end of current carrying conductor.	Understand	6
B) Potential is given by $V = 2(x+1)^2(y+2)^2(z+2)^2$ Volts in free space. Calculate a) Potential b) $\vec{E}$ c) $\vec{D}$ d) ρ_v at point $(1, 2, 3)$	Understand	6
C) State and Explain Ampere's circuital law. When can we use Ampere's circuital law to determine the magnetic field?	Understand, Remember	6
Q. 3 Solve Any Two of the following.		12
A) Define the term Electric Field Intensity and Show that $\mathbf{E} = -\nabla V$, If V & $V + dV$ be the potentially neighboring equipotential surfaces.	Understand, Remember	6
B) In the region where $\sigma = 0, \epsilon_r = 2.5, \mu_r = 10$. Determine whether following pairs of field satisfy Maxwell's equation, $\vec{E} = 2y \vec{a}_y, \vec{H} = 5x \vec{a}_x$	Understand	6

C)	State and explain the basic Maxwell's Equations in its point and integral form with their proper significance.	Understand, Remember	6
Q.4	Solve Any Two of the following.		12
A)	Describe various types of transmission line and list out the application of transmission line	Understand, Remember	6
B)	An open wire transmission line has the following primary constants $R = 4 \Omega/\text{km}$, $L = 3.5\text{mH}/\text{km}$, $C = 0.009 \mu\text{F}/\text{km}$, $G = 0.29 \mu\Omega^{-1}\text{km}^{-1}$ Determine: Z_0 , α , β and phase velocity for frequency of operation 1 kHz	Understand	6
C)	Define: Propagation constant, characteristic impedance, reflection coefficient and VSWR	Understand	6
Q. 5	Solve Any Two of the following.		12
A)	State and derive Poynting's theorem. What is average power Density?	Understand, Remember	6
B)	For perfect conducting medium, Show that $\alpha = \beta = \sqrt{\pi f \mu \sigma}$	Understand	6
C)	A 6580 MHz uniform plane wave is propagating in material medium of $\epsilon_r = 2.25$. If the amplitude of the electric field is 500 V/m and material is assumed to be lossless, Find: a) the phase constant b) the wavelength in medium c) the velocity of propagation d) the intrinsic impedance e) propagation constant f) the amplitude of magnetic field intensity	Understand	6
*** End ***			