PVP 20

Code: 20BS1402

II B.Tech - II Semester – Regular / Supplementary Examinations
MAY - 2024

ELECTROMAGNETIC FIELDS & WAVES
(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level CO – Course Outcome

			BL	CO	Max. Marks
UNIT-I					
1	a)	Derive Laplace's and Poisson's equation.	L3	CO1	7 M
	b)	Determine the electric field intensity due to infinite line charge, at a point perpendicular to its plane and at a given distance from the line charge from first principles.	L3	CO2	7 M
OR					
2	a)	Point charges Q_1 = 5 μC and Q_2 = -4 μC are placed at (3, 2, 1) and (-4, 0, 6) respectively. Determine the force on Q_1.	L3	CO1	7 M
	b)	Show that $E = -\nabla V$.	L3	CO2	7 M
UNIT-II					
3	a)	Using Biot-Savart's law, Derive the magnetic field intensity on the axis of a circular loop with radius R and carrying a steady current I.	L3	CO2	7 M

	b)	A circular loop of radius ρ = 5m causes a current of 10A. Solve the magnetic field intensity $\vec{H}$ at point (0,0,0.5).	L3	CO2	7 M
		OR			
4	a)	Develop the expression for magnetic field Intensity at a point 'P' due to an infinite line current element.	L3	CO2	7 M
	b)	Derive the equation to show that curl of magnetic field intensity in equal to current density.	L3	CO2	7 M
		UNIT-III			
5	a)	Write and explain Maxwell's equations in integral form for time varying Fields.	L2	CO3	7 M
	b)	In a material for which σ = 5.0 s/m and $\in_r$ = 1, the electric field intensity is E = 250 $Sin10^{10}t$ (V/m). Predict the conduction and displacement current densities, and the frequency at which they have equal magnitudes.	L2	CO3	7 M
		OR			
6	a)	State and explain Faraday's laws of electromagnetic induction.	L2	CO3	7 M
	b)	Explain (i) Conduction Current. (ii) Displacement current.	L2	CO3	7 M
		UNIT-IV			
7	a)	Derive the expression for attenuation and phase constants of uniform plane wave.	L3	CO3	7 M

	b)	If ε_r = 9, $\mu=\mu_0$ for the medium in which a wave with frequency f = 0.3GHz is propagating, determine propagation constant and intrinsic impedance of the medium when i) σ = 0 and ii) σ = 10 mho/m.	L3	CO3	7 M
OR					
8	a)	State and prove Poynting theorem.	L2	CO3	7 M
	b)	For good dielectrics derive the expression for α, β, V_p and η.	L3	CO3	7 M
UNIT-V					
9	a)	Define and derive the reflection coefficient of a wave which is incident normally on a dielectric.	L3	CO4	7 M
	b)	Calculate the depth of penetration δ, of an EM wave in copper at f= 60 Hz and f=100 MHz . For Copper , $\sigma = 5.8 \times 10^7$ mho /m , ε_r =1, μ_r =1.	L3	CO4	7 M
OR					
10	a)	Define and derive the transmission coefficient of a wave which is incident normally on a dielectric?	L3	CO4	7 M
	b)	What is Brewster Angle? Derive the expression for Brewster angle.	L3	CO4	7 M