PVP 23

Code: 23EC3401

II B.Tech - II Semester – Regular Examinations - MAY 2025

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	Define distance vector with an example.	L2	CO1
b)	Write a short notes on continuity equation.	L2	CO1
c)	Write any two Maxwell's equations in point form.	L2	CO2
d)	Define Magnetic Flux Density.	L2	CO2
e)	Distinguish conduction and displacement current densities.	L2	CO3
f)	Define Faraday's law.	L2	CO3
g)	Give the expressions for Wave equations.	L2	CO3
h)	Define skin depth.	L2	CO3
i)	A 100+j50Ω load is connected to a 75 Ω lossless line. Find Γ.	L2	CO4
j)	Write the relation between VSWR and Reflection Coefficient.	L2	CO4

PART – B

			BL	CO	Max. Marks
UNIT-I					
2	a)	With neat diagram, Explain the spherical system with coordinates (r, Θ, ϕ).	L2	CO1	5 M
	b)	A uniform line charge ρ_L = 25nC/m lies on the axis x=3m and y=4m in free space. Calculate the electric field intensity at a point (2,3,15)m.	L3	CO2	5 M
OR					
3	a)	Define Gauss's Law? Derive an equation $\nabla . D = \rho_{v.}$	L3	CO1, CO2	5 M
	b)	Derive Laplace's and Poisson equation.	L3	CO2	5 M
UNIT-II					
4	a)	Define and Explain Ampere's circuit law.	L2	CO2	5 M
	b)	Determine J at (2,0,0) in cylindrical coordinates if the magnetic field, H = 50 sinϕ a_z mA/m^2.	L3	CO2	5 M
OR					
5	a)	In a magnetic field, H = $2a_x$ + $5a_y$+ $1a_z$ A/m exists at a point in a medium μ_r =4. Calculate the magnetic flux density at the point.	L3	CO2	5 M
	b)	State Biot-savart law and obtain the expression for magnetic field intensity at a point P due to an infinite current line element.	L3	CO2	5 M

UNIT-III					
6		With necessary explanation, derive the Maxwell's equation in differential and integral forms for time varying fields.	L3	CO3	10 M
OR					
7	a)	Given the conduction current density in a lossy dielectric as $J_c = 0.02 \sin 10^9 t$ A/m^2. Calculate the displacement current density if $\sigma = 103$ mho/m and $\varepsilon_r = 6.5$.	L3	CO3	5 M
	b)	What is inconsistency in Ampere's law? Develop an expression for the displacement current density.	L3	CO3	5 M
UNIT-IV					
8		Define the terms Good conductor and loss less Dielectrics. Discuss about Wave propagation Characteristics in Good conductors.	L2	CO3	10 M
OR					
9	a)	State and prove Poynting theorem.	L2	CO3	5 M
	b)	Explain about Circular and Elliptical polarization.	L2	CO3	5 M
UNIT-V					
10	a)	Derive an equation of two-wire transmission line Input Impedance.	L3	CO4	5 M

	b)	A Lossy cable which has R = 25.23 Ω/m, L =26H/m, C = 2pF/m, and G = 0 operates at f = 5MHz. Find the attenuation constant and phase constant of the line.	L3	CO4	5 M
OR					
11	a)	Discuss the condition for lossless transmission lines.	L2	CO4	5 M
	b)	Derive the transmission line equations.	L3	CO4	5 M