PVP 23

Code: 23EC3401

II B.Tech - II Semester–Regular/Supplementary Examinations APRIL 2026

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 divergence and state its physical significance.	L1	CO1
b)	Write Coulomb's law in vector form.	L1	CO1
c)	Define magnetic scalar potential.	L1	CO2
d)	State Faraday's law of electromagnetic induction.	L1	CO3
e)	What is polarization in dielectrics?	L1	CO3
f)	Define propagation constant.	L1	CO4
g)	What is attenuation constant?	L1	CO4
h)	Define VSWR.	L1	CO4
i)	What is intrinsic impedance of free space?	L1	CO4
j)	Define primary constants of transmission line.	L1	CO4

PART – B

			BL	CO	Max. Marks
UNIT-I					
2	a)	Derive expression for electric potential due to a point charge.	L3	CO2	5 M
	b)	A Uniform line charge, infinite in extent with lined charge density ρ_L = 20nC/m lies along Z-axis. Find $\bar{E}$ at (6,8,3) m.	L2	CO2	5 M
OR					
3	a)	Derive Laplace's equation from Maxwell's equations.	L3	CO2	5 M
	b)	Given $V = x^2y$, find electric field intensity E.	L2	CO2	5 M
UNIT-II					
4	a)	Derive expression for magnetic energy stored in a magnetic field.	L3	CO2	5 M
	b)	Find magnetic field due to infinite line current of 10A at a radius of 0.1m.	L4	CO2	5 M
OR					
5	a)	Explain Ampere's circuital law with application.	L3	CO2	5 M
	b)	The magnetic field intensity is given by $\bar{H} = ycos2x\ \bar{a}_x + (y + e^x)\ \bar{a}_z$. Determine the current density $\bar{J}$ at origin.	L4	CO2	5 M
UNIT-III					
6	a)	Derive Maxwell's equations in differential form.	L3	CO3	5 M
	b)	Determine displacement current density for $E=100\sin(10^8t)$ V/m.	L4	CO3	5 M
OR					

7	a)	Explain magnetic boundary conditions for normal components of D and B.	L3	CO3	5 M
	b)	Explain the consistency in Amphere's Law and derive an expression for displacement current density.	L4	CO3	5 M
UNIT-IV					
8	a)	Derive wave equations in conducting medium.	L3	CO3	5 M
	b)	Derive expression for power flow using Poynting theorem.	L4	CO3	5 M
OR					
9	a)	Explain skin effect and derive expression for skin depth.	L3	CO3	5 M
	b)	Calculate wavelength of a wave, when it is propagating at a frequency of 3 GHz in free space.	L4	CO3	5 M
UNIT-V					
10	a)	Derive the expression for input impedance of a transmission line using general line equations.	L3	CO4	5 M
	b)	Solve the reflection coefficient of a transmission line with a characteristic impedance of 50Ω terminated with a load of 75Ω.	L4	CO4	5 M
OR					
11	a)	Derive expression for VSWR in terms of reflection coefficient.	L3	CO4	5 M
	b)	Find the characteristic impedance Z_0 and velocity of a lossless transmission line at a frequency of 100 KHz having L=1μH/m, C=100pF/m.	L4	CO4	5 M