

Reg.No.:



VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN  
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]  
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

**Question Paper Code: 70053**

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2025

Fourth Semester

Electronics and Communication Engineering

U19EC412 - ELECTROMAGNETIC FIELDS

(Regulation 2019)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

**PART – A**

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	List any two co-ordinate systems which you are familiar with.	2	K1	CO1
2.	Define Del operator. Mention its applications.	2	K1	CO1
3.	State Coulomb's law in vector form.	2	K1	CO2
4.	Define a point charge.	2	K1	CO2
5.	Define dielectric strength of a material.	2	K1	CO3
6.	Obtain Poisson's equation from Gauss's law.	2	K2	CO3
7.	State Ampere's Circuital law.	2	K1	CO4
8.	What is meant by magnetization?	2	K1	CO4
9.	State Poynting theorem.	2	K1	CO5
10.	Find the intrinsic impedance of free space.	2	K3	CO5

**PART – B**

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	i. State and Prove Stoke's theorem.	7	K2	CO1
	ii. Find the divergence of the vector field $A = x^2yza_x + xza_z$	6	K3	

(OR)

b)	i.	Describe briefly about cylindrical co-ordinate system along with necessary diagrams and expressions.	7	K2	CO1
	ii.	Find the Gradient of the scalar field $V = \rho^2 z \cos 2\phi$	6	K3	
12.	a)	State and Gauss's law. Explain any two its applications with necessary derivation.	13	K2	CO2
		(OR)			
	b)	Derive the expression for Electric field intensity at field point due to line charge of infinite length.	13	K2	CO2
13.	a)	Derive continuity equation of current in both integral and differential form.	13	K2	CO3
		(OR)			
	b)	Derive the boundary conditions for electric field at the interface of two different dielectric mediums.	13	K2	CO3
14.	a)	Define Amper's circuital law. Derive any two application of Amper's law.	13	K2	CO4
		(OR)			
	b)	Validate the expression which relates Magnetic Flux density B and Magnetic vector potential A. Demonstrate the expression with the supporting laws.	13	K2	CO4
15.	a)	Explain about the propagation of EM waves in good conductor and pure dielectric.	13	K2	CO5
		(OR)			
	b)	State and Prove Poynting theorem. Also describe the Poynting vector, average power and instantaneous power.	13	K2	CO5

#### PART – C

(1 x 15 = 15Marks)

Q.No.	Questions	Marks	KL	CO	
16.	a)	Derive Maxwell's equations in integral and point form in time-varying field.	15	K2	CO5
		(OR)			
	b)	The plane wave $E = 50 \sin(\omega t - 5x) a_y$ V/m in a lossless medium with $\mu = 4\mu_0, \epsilon = \epsilon_0$ encounters a lossy medium with $\mu = \mu_0, \epsilon = 4\epsilon_0, \sigma = 0.1$ mhos/m normal to the x-axis at $x = 0$ . Determine		K3	CO5
	i.	$\Gamma, \tau$ and $s$	5		
	ii.	$E_r$ and $H_r$	5		
	iii.	$E_t$ and $H_t$	5		