QP Code: S253A036 | Reg. No | | | | | | | | | | | AY 23

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

B. Tech (Third Semester – Regular & Supplementary) Examinations, November 2025

23BELPC23003/23BEEPC23003 – ELECTROMAGNETIC FIELDS (EMF)

(EE & EEE)

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	What is the limits of the coordinate in cylindrical system.	CO1	K1
b.	Write the expression for electric field intensity for surface charge?	CO2	K2
c.	Write the expressions related to magnetic scalar and vector potentials	CO3	K2
d.	Write Helmholtz's wave equations in scalar potentials .	CO4	K4
e.	A toroid is wound with 300 turns on a ebonite ring having a cross sectional area of 4 cm^2 *and* a mean circumference of 35cm. Calculate the inductance of coil .	CO5	K3

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions		Marks	CO #	Blooms Level
2. a.	Derive an expression for transformation of unit vectors from cylindrical to cartesian system.	5	CO1	K4
b.	Express the vector $\vec{A} = \frac{K}{\rho^2}\overrightarrow{a_\rho} + 5\sin 2\varphi\overrightarrow{a_z}$ in the rectangular coordinate system	5	CO1	K4
	(OR)			
c.	State and Proof divergence theorem .	5	CO1	K4
d.	Find the Gradient of the following scalar field a) v = e^{-z}sin2xcoshy b) u = ρ^2zcos2φ	5	CO1	K3
3.a.	Derive an expression for coulomb's law .	5	CO2	K3
b.	A point charge 1mc & -2mc are located at (4,2,-3) & (-2,-1,5) respectively. Calculate the electric force on a 100nc charge located at (0, 2,1) & electric field intensity at that point.	5	CO2	K3
	(OR)			
c.	Derive a Relation between E & V Maxwell's Equation.	5	CO2	K3
d.	Derive an expression for Energy density in Electrostatic fields.	5	CO2	K4
4.a.	Derive an expression for Biot savart's Law	5	CO3	K3
b.	A circular loop located on $x^2 + y^2 = 9$, z = 0 carries a direct current of 10 A along a_φ. Determine H at (0, 0, 4) & (0, 0, -4).	5	CO3	K3
	(OR)			
c.	Explain about Magnetic scalar potential.	5	CO3	K2
d.	State and derive Ampere's Circuital law and derive an application of Ampere's Law for infinite Line current .	5	CO3	K3

5.a.	What is displacement current, derive the equation for the capacitor.	5	CO4	K3
b.	Write short notes on faradays law of electromagnetic induction for transformer emf.	5	CO4	K3
	(OR)			
c.	A parallel plate capacitor with plate area of 5cm2 & plate separation of 3mm has a voltage 50sin103t V applied to its plate. Calculate the displacement current assuming $\varepsilon=2\varepsilon_0$	5	CO4	K3
d.	Derive the equation for time varying vector potential.	5	CO4	K4
6.a.	Derive an expression of self-Induction of a toroid.	5	CO5	K3
b.	Find the energy stored in the solenoid having 50cm long and 5 cm in diameter and is wound with 2000 turns of wire , carrying a current of 10 A .	5	CO5	K3
	(OR)			
c.	Distinguish between Self Inductance and Mutual Inductance .	5	CO5	K4
d.	Evaluate the inductance of a solenoid of 2500 turns wound uniformly over the length of 0.5m on a cylindrical paper tube 4cm. The medium is air .	5	CO5	K3

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