QP Code: RN23BTECH085 | Reg. No | | | | | | | | | | | AY 23

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, ODISHA, GUNUPUR
(GIET UNIVERSITY)

B. Tech (Third Semester - Regular) Examinations, November – 2024

23BELPC23003/23BEEPC23003 - ELECTROMAGNETIC FIELDS

(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)**

		CO #	Blooms Level
Q.1.	Answer ***ALL*** questions		
a.	Convert a point Q (2 , 3, 5) to spherical coordinates	CO1	K3
b.	Write the expression for electric field due to volume charge distribution	CO2	K2
c.	Describe the Maxwell's Equations in static fields.	CO3	K2
d.	Enumerate wave equations for Scalar and vector potentials.	CO4	K2
e.	Evaluate the inductance of a solenoid of 2500 turns wound uniformly over a length of 0.5m on a cylindrical paper tube 4 cm. The medium is air ($\mu_r = 1$) .	CO5	K5

PART – B **(10 x 5 = 50 Marks)**

	Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a.	Transform a vector from Spherical to cartesian coordinate system	5	CO1	K2
b.	If A = $4a_\rho + 1\ a_\varphi + 3\ a_z$ & B = $2a_\rho + 4\ a_\varphi + 5\ a_z$ are given at point P (2, π/6, 5) & Q (4, π/3, 5) find C= A+B at point S (2, π/4,4)	5	CO1	K3
	(OR)			
c.	For a vector field explicitly show that the divergence of the curl of any vector field is zero	5	CO1	K2
d.	The electron density distribution within a spherical volume with radius of 2m is given as $n_e = (300/r)\cos(\varphi/4)$ electrons/m^3. Find the charge enclosed if the charge on an electron is -1.6×10^{-19} coulomb.	5	CO1	K3
3.a.	State and prove Gauss's Theorem. Explain why it is divergence theorem?	5	CO2	K2
b.	Derive an expression for electric field intensity due to a line charge.	5	CO2	K3
	(OR)			
c.	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
d.	Given the potential $V= 10/r^2 (\sin\theta\cos\varphi)$ Find the electric flux density D at (2,π/2,0) Calculate the work done in moving a 10 μc charge from point A ($1,30^0, 120^0$) to B($4,90^0, 60^0$)	5	CO2	K3
4.a.	Derive the expression for a magnetic field due to straight current carrying conductor.	5	CO3	K3
b.	Given the magnetic vector potential $A = -\rho^2/4$ wb/m, calculate the total magnetic flux crossing the surface $\varphi = \pi/2$, $2 \le \rho \le 3$m, $0 \le z \le 2$m.	5	CO3	K3
	(OR)			
c.	Explain about magnetic vector potential.	5	CO3	K2
d.	Differentiate between electrostatics and magneto statics	5	CO3	K2

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	K2
	(OR)			
c.	A parallel plate capacitor with plate area of $5cm^2$ & plate separation of 3mm has a voltage $50\sin 10^3 t$ 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	K2
6.a.	Derive an expression of self-Induction of a toroid	5	CO5	K2
b.	A toroid is wound with 300 turns on a ebonite ring having a cross sectional area of 4 cm^2 and mean circumference of 35 cm . Calculate the inductance of coil .	5	CO5	K3
	(OR)			
c.	Derive an expression for mutual Inductance between a long straight wire and a square loop ?	5	CO5	K2
d.	Evaluate the induced emf in the loop if the wire carries a current of 50 A and loop has an instantaneous velocity v = 10 m/s at a location b = 0.2 m .Take a = 0.1 m and assume that loop has large resistance	5	CO5	K5

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