



GIET UNIVERSITY, GUNUPUR - 765022

B. Tech (Third Semester Regular) Examinations, December - 2023

Electromagnetic Fields

21BELPC23003 / 21BEEPC23003/ 22BELPC23003 / 22BEEPC23003

(EE & EEE)

Time: 3 hrs

Maximum: 70 Marks

(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 co-ordinates.	CO1	K3
b. What is physical significance of divergence and State Divergence Theorem ?	CO1	2
c. What is Gaussian surface? What are the conditions to be satisfied in special Gaussian surface?	CO2	K2
d. Write the expression for magnetic field due to straight current carrying conductor.	CO3	K3
e. What is displacement current and how it affects Maxwell's equation?	CO4	K2

PART - B

(15 x 4 = 60 Marks)

Answer **ALL** questions

	Marks	CO #	Blooms Level
2. a. If $A = 4a_\rho + 1 a_\phi + 3 a_z$ & $B = 2a_\rho + 4 a_\phi + 5 a_z$ are given at point P $(2, \pi/6, 5)$ & Q $(4, \pi/3, 5)$ find $C = A+B$ at point S $(2, \pi/4, 4)$	8	CO1	K3
b. Determine gradient of the scalar field $A = \cos \theta \sin \phi \ln r + r^2 \cos \phi$	7	CO1	K3
(OR)			
c. Determine Laplacian of a scalar field $A = \rho z \sin \phi + z \cos^2 \phi + 2\rho$	8	CO1	K3
d. For a scalar field explicitly show that the curl of gradient of scalar is zero.	7	CO1	K4
3.a. What is uniqueness theorem? Explain briefly.	7	CO2	K2
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.	8	CO2	K3
(OR)			
c. Determine D at $(4, 0, 3)$ if there is a point charge $-4\pi \text{ mc}$ at $(3, 0, 0)$ & line charge $3\pi \text{ mc/m}$ along the Y-axis.	7	CO2	K3
d. Given the potential $V = 10/r^2 (\sin\theta \cos\phi)$	8	CO2	K3
(i) Find the electric flux density D at $(2, \pi/2, 0)$			
(ii) Calculate the work done in moving a $10 \mu\text{c}$ charge from point A $(1, 30^\circ, 120^\circ)$ to B $(4, 90^\circ, 60^\circ)$			

4.a.	Derive the equation for magnetic flux density - Maxwell's equation.	7	CO3	K2
b.	Given the magnetic vector potential $A = -\rho^2 / 4$ wb/m, calculate the total magnetic flux crossing the surface $\phi = \pi/2$, $2 \leq \rho \leq 3$ m, $0 \leq z \leq 2$ m.	8	CO3	K3
(OR)				
c.	Starting from Ampere's Law, Derive Maxwell's equation in integral form.	7	CO3	K2
d.	Derive the expression of H at the point outside of the infinitely long coaxial transmission line using amperes law.	8	CO3	K3
5.a.	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 $\epsilon = 2\epsilon_0$	7	CO4	K3
b.	Derive an expression for time varying potentials.	8	CO4	K2
(OR)				
c.	Write short notes on faradays law of electromagnetic induction for motional emf.	7	CO4	K2
d.	Write the Maxwell's equation in time varying differential and integral form.	8	CO4	K3

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