

--	--	--	--	--	--	--	--	--	--



GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Third Semester - Regular) Examinations, December – 2022

21BELPC23003 – Electromagnetic Fields

(EE & EEE)

Time: 3 hrs

Maximum: 70 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. Convert a point (1,2,3) to cylindrical coordinate system.	1	2
b. Mention the various applications of Amperes Law.	3	2
c. Write the Maxwell's equation for static field.	3	2
d. Define Faraday's Law of electromagnetic induction and Maxwell's equation in time varying field.	4	3
e. Give the relation between electric field intensity (E) and electric potential (V)	2	3

PART – B

(15 x 4 = 60 Marks)

Answer ALL questions

	Marks	CO #	Blooms Level
2. a. State and derive the expression for the Stoke's Theorem.	7	1	2
b. Two vector A & B are given at a point (2, -1, 4) in space as $A = 20x a_x - 15y a_y + 10z a_z$ & $B = -3x^3 a_x - 4y a_y + 10xy a_z$ determine (a) The scalar component of A in the direction of vector B. (b) A unit vector perpendicular to both (A x B).	8	1	3
(OR)			
c. For a vector field explicitly show that the divergence of the curl of any vector field is zero.	7	1	2
d. Determine Laplacian of a scalar field $A = \rho z \sin \phi + z^2 \cos^2 \phi + \rho^2$.	8	1	3
3.a. A point charge $2mc$ & $-3mc$ are located at (1,2,-3) & (-2,-1,4) respectively. Calculate the electric force on a $100nc$ charge located at (0,3,1) & electric field intensity at that point.	7	2	3
b. Derive the relation between E & V-Maxwell's equations.	8	2	2
(OR)			
c. Determine D at (3,0,2) if there is a point charge $-3\pi mc$ at (2,0,0) & line charge $2\pi mc/m$ along the Y-axis.	7	2	3
d. What is uniqueness theorem, explain briefly.	8	2	2
4.a. Explain and derive the equation for magnetic scalar potential.	7	3	2
b. Given the magnetic vector potential $A = -\rho^2 / 4$ wb/m, calculate the total magnetic flux crossing the surface $\phi = \pi/2$, $1 \leq \rho \leq 2$ m, $0 \leq z \leq 3$ m.	8	3	3
(OR)			
c. Discuss about the applications of amperes law for infinite line current.	7	3	2
d. A circular loop located on $x^2 + y^2 = 25$, $z = 0$ carries a direct current of 5A along a_ϕ , determine H at (0,0,2) & (0,0,-5)	8	3	3

- | | | | | |
|------|--|---|---|---|
| 5.a. | A parallel plate capacitor with plate area of 3 cm^2 & plate separation of 3mm has a voltage $20 \sin 10^3 t \text{ V}$ applied to its plate. Calculate the displacement current assuming $\epsilon = 2\epsilon_0$. | 7 | 4 | 3 |
| b. | Derive the expression of magnetic field intensity at a point due to a current element by using Biot-savart's law. | 8 | 3 | 3 |
| (OR) | | | | |
| c. | Derive the expression for displacement current. | 7 | 4 | 2 |
| d. | State faradays law of electromagnetic induction and derive the Maxwell's equation in time varying for using transformer emf. | 8 | 4 | 2 |

--- End of Paper ---