GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fifth Semester Regular) Examinations, December – 2023

21BECPC35004 – Electromagnetic Waves

(ECE)

Time: 3 hrs   Maximum: 70 Marks

(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.	Find the area of the parallelogram by the vectors $\vec{A}= 4a_x–a_y+5a_z$ and $\vec{B}= -a_x+2a_y+3a_z$.	CO1	K3
b.	Define Stoke's theorem with proper expression.	CO1	K2
c.	Why magnetic monopole does not exist? What is its corresponding equation?	CO2	K2
d.	If the VSWR is 12.5 find out reflect coefficient for the plane wave.	CO3	K1
e.	Explain about Types of transmission line	CO3	K1

PART – B   (15 x 4 = 60 Marks)

Answer **ALL** questions

		Marks	CO #	Blooms Level
2. a.	Verify the Stoke's theorem for the region shown in figure below. The magnetic field intensity is given as $\vec{H} = y^2 a_x + 3x a_y$	8	CO1	K3
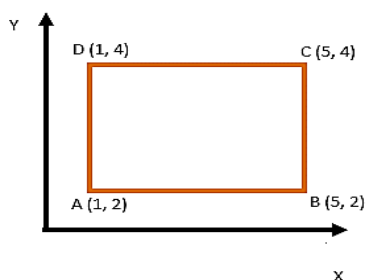
		Marks	CO #	Blooms Level
b.	Explain about gradient. Define it in rectangular, cylindrical and spherical coordinate system. Write the properties and key points.	7	CO1	K2

(OR)

		Marks	CO #	Blooms Level
c.	Two point charges are placed at a distance 8 cm from each other. If one charge is 10 times of the other, find out the expression for the magnitude of charge between them. { $\varepsilon_r = \dfrac{1}{4\varepsilon_0}$ }	8	CO1	K3
d.	State and Explain Gauss Law with proper expressions.	7	CO1	K2
3.a.	Write Maxwell's Equations in differential, integral and phasor form.	10	CO2	K3

b.	A circular loop located on $x^2 + y^2 = 9$, z =0 carries a direct current of 10 Amp along a_ϕ. Determine magnetic field intensity H at (0, 0, 4) and (0, 0,-4).	5	CO2 K3

<div align="center">(OR)</div>

c.	In detail explain about modified Amperes Circuital Law. What is the drawback of ampere's circuital law?	10	CO2 K3
d.	Explain in detail about Biot Savarts Law with diagram and expressions.	5	CO2 K2
4.a.	In free space, a plane wave with H_i=10 cos (10^8t-βz)a_x mA/m is incident normally on a lossless dielectric medium where ε =2$ε_0$ and μ=8$μ_0$. Determine the reflected wave Hr and Er.	10	CO3 K3
b.	Differentiate between skin depth and loss tangent with relevant formulas .	5	CO3 K1

<div align="center">(OR)</div>

c.	A lossy dielectric has an intrinsic impedance of $200 < 30^0$ ohm at a particular angular frequency "w" at that frequency the plane wave propagating through the dielectric has the magnetic field component $H = 10e^{-\alpha x} \cos(wt - 0.5x)a_y \, A/m$. Find E and α. Determine the skin depth.	10	CO3 K3
d.	Derive the Helmoltz Equation in lossy dielectric.	10	CO3 K1

5.a.	Find the cut-off frequency for the TE$_{12}$ mode in a hollow rectangular waveguide whose dimensions are
	   i) a= 2.286 cm and b= 1.016 cm
	   ii) b= 2.286 cm and a= 1.016 cm
	{a is the broad dimension and b is the narrow dimension }
		8	CO4 K3

b.	Explain with derivation about the impedance matching by a quarter wave transmission line.	7	CO4 K2

<div align="center">(OR)</div>

c.	A lossless transmission line of length 100 m has an inductance of 28μH and a capacitance of 20 nF. Find
	   i) Phase velocity
	   ii) Characteristic impedance
	   iii) Phase constant at 100 KHz frequency
		8	CO4 K3

d.	Derive Expression for the input impedance of the transmission line.	7	CO4 K2

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