

SEMESTER END REGULAR EXAMINATIONS, AUGUST-2021

U.G		EEE	Degree		Bachelor of Technology		
Academic Year		2020-2021	Sem.		3 rd		
Course Code		19EE304	Course Title				
			ELECTROMAGNETIC FIELD THEORY				
Duration		3 Hours	Maximum Marks		60 (SIXTY)		
Remember %	11	Understand %	78	Apply %	11	Analyze %	--

SECTION-I (Answer all the questions)

6 x 2 = 12 Marks

No.1	Questions (a to f)	RBT Level	COs
a	Find the relation between cartesian coordinates and spherical coordinates.	Remember	CO#1
b	Recall Gauss's law and mention any two applications.	Remember	CO#2
c	Relate electric field intensity and electric potential.	Remember	CO#3
d	What is the consequence of polarization in dielectrics?	Remember	CO#4
e	Recall Lorentz Force equation and explain its significance.	Remember	CO#5
f	Define Faraday's laws of electromagnetic induction.	Remember	CO#6

SECTION-II (Answer all the questions)

4 x 12 = 48 Marks

No.	Questions (2 to 9)	RBT Level	COs	Marks	
2	a	Explain Coulomb's law in vector form.	Understand	CO#2	4
	b	Identify the electric field intensity produced by a point charge distribution at P(1,1,1) caused by four identical 3 nC point charges located at A(1,1,0), B(-1,1,0), C(-1,-1,0) and D(1,-1,0).	Understand	CO#2	8
OR					
3	a	Derive the expression for electric field intensity due to infinite sheet of charge.	Understand	CO#2	6
	b	Express the given point P(-1, 2, 4) in Cartesian and cylindrical coordinate systems.	Understand	CO#1	6
4	a	Derive the boundary conditions of the normal and tangential components of electric field at the interface of two media with different dielectrics.	Understand	CO#3	8
	b	A parallel plate capacitor has a plate area of 1.5 m ² and a plate separation of 5 mm. there are two dielectrics in between the plates. The first dielectric has a thickness of 3 mm with a relative permittivity of 6 and second has a thickness of 2 mm with a relative permittivity of 4. Determine the capacitance.	Understand	CO#3	4
OR					

5	a	Using Gauss's law, obtain the expression for electric field intensity due to an infinite line charge.	Understand	CO#3	4
	b	Calculate the work done in moving a charge of 3 C in a uniform electric field $\vec{E} = 10 \vec{a}_x + 12 \vec{a}_y + 5 \vec{a}_z$ V/m between the points i)(0,0,0) to (0,0,3), ii)(0,1,0) to (4,0,3).	Understand	CO#4	8
6	a	State and prove Ampere's circuital law in point form.	Understand	CO#5	4
	b	Derive the expression for Inductance of a solenoid.	Understand	CO#5	8
OR					
7	a	Derive the expression of force for the following cases: i) Due to a charged particle in magnetic field. ii) Differential current element.	Understand	CO#4	6
	b	If a point charge of 3 coulombs moves with a velocity of $\vec{u} = 7\vec{a}_x + 4\vec{a}_y - 6\vec{a}_z$ m/s, find the force exerted: i) if the electric field intensity is $\vec{E} = 12\vec{a}_x + 4\vec{a}_y - 6\vec{a}_z$ V/m. ii) if the flux density is $\vec{B} = 6\vec{a}_x + 5\vec{a}_y + 6\vec{a}_z$ wb/m ² .	Apply	CO#4	6
8	a	Derive Maxwell's equations for time varying fields.	Understand	CO#6	6
	b	Does the fields $\vec{E} = E_m \sin x \sin t \vec{a}_y$ and $\vec{H} = \left(\frac{E_m}{\mu_0}\right) \cos x \cos t \vec{a}_z$ satisfy Maxwell's equation?	Apply	CO#6	6
OR					
9	a	Show that in a capacitor the conduction current and displacement current are equal.	Understand	CO#5	6
	b	In a material for which $\sigma = 5$ S/m and $\epsilon_r = 1$, the electric field intensity is $E = 250 \sin 10^{10}t$ V/m. find the conduction and displacement current densities and the frequency at which they have equal magnitudes.	Understand	CO#6	6
