INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

Department of Electrical and Electronics Engineering

TUTORIAL QUESTION BANK

Course Name	**:**	**ELECTROMAGNETIC FIELDS**
Course Code	**:**	**AEEB10**
Class	**:**	**B. Tech III Semester**
Branch	**:**	**Electrical and Electronics Engineering**
Year	**:**	**2019 – 2020**
Course Coordinator	**:**	**Dr. B . Muralidhar Nayak, Assisstant Professor, EEE**
Course Instructors	**:**	**Mr. T. AnilKumar, Assisstant Professor, EEE** **Dr. B . Muralidhar Nayak, Assisstant Professor, EEE**

COURSE OBJECTIVES:

The course should enable the students to:

I	Demonstrate the concept of electrostatic field intensity and electric potential.
II	Illustrate polarization of dielectrics and the behavior of conductors and dielectrics in an electric field.
III	Understand the concept of field intensity and flux density in magnetic fields.
IV	Discuss forces in magnetic fields and laws of electromagnetic induction
V	Summarize the concept of time varying field and analyze propagation of electro-magnetic waves.

COURSE LEARNING OUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

AEEB10.1	Analyze the force and electric field intensity in the electrostatic field with knowledge of vector algebra.
AEEB10.2	Identify the characteristics of electrostatic fields in terms of definitions.
AEEB10.3	State different laws which defines characteristics of electrostatic fields.
AEEB10.4	Illustrate polarization of dielectrics and the behavior of conductors and dielectrics in electric field.
AEEB10.5	Demonstrate the electric dipole and its effect on electric field.
AEEB10.6	Estimate the capacitance of parallel plates, spherical and coaxial capacitors with composite dielectrics.
AEEB10.7	Summarize the concept of magneto static and interrelate the terms of magnetic fields.
AEEB10.8	Interpret the magnetic field intensity due to circular, square and solenoid current carrying wire.
AEEB10.9	Use Ampere circuital law to determine magnetic field intensity due to an infinite sheet of current, a long current carrying filament and its applications.

AEEB10.10	Predict the force due to moving charge in the magnetic field for different configuration of current carrying conductor.
AEEB10.11	Demonstrate the magnetic dipole and its effect on magnetic field.
AEEB10.12	Calculate the self inductance and mutual inductance for different configurations of wires and applications of permanent magnet.
AEEB10.13	State the Faraday's laws of electromagnetic induction and nature of voltage induced in the coil.
AEEB10.14	Derive and explain the differential and integral form of Maxwell's equation in time varying fields and fields varying harmonically with time.
AEEB10.15	Discuss the electromagnetic wave propagation and its analysis.
AEEB1016	Apply the concept of electromagnetic and electrostatic fields to solve real time world applications.
AEEB10.17	Process the knowledge and skills for employability and to succeed national and international level competitive examinations.

S. No	QUESTION	Blooms Taxonomy Level	CO	Course Learning Outcomes
UNIT - I INTRODUCTION TO ELECTROSTATICS				
PART – A (SHORT ANSWER QUESTIONS)				
1	Write the mass of electron and proton.	Remember	CO 1	AEEB10. 2
2	State coloumb's law and explain its importance..	Remember	CO 1	AEEB10. 3
3	Define electric field and write its properties.	Remember	CO 1	AEEB10.2
4	Explain force between two charges due to electric field.	Understand	CO 1	AEEB10. 1
5	Define electric field intensity and write general expression of field intensity.	Remember	CO 1	AEEB10. 1
6	Write the expression for electric field intensity on n charge.	Remember	CO 1	AEEB10. 1
7	Write the expression for electric field intensity on line charge.	Remember	CO 1	AEEB10. 1
8	Write the expression for electric field intensity on surface charge.	Remember	CO 1	AEEB10. 1
9	State Guass law and define Gaussian surface.	Remember	CO 1	AEEB10. 3
10	Write any three applications of Guass law.	Understand	CO 1	AEEB10. 3
11	Give the work done on point charge in terms of electric field intensity..	Remember	CO 1	AEEB10. 1
12	Define potential difference and write relevant expression.	Remember	CO 1	AEEB10. 2
13	Write and explain each term of the Poisson's equation.	Understand	CO 1	AEEB10. 3
14	State Maxwell's curl equation.	Remember	CO 1	AEEB10. 3
15	Define potential gradient and write relevant expression.	Remember	CO 1	AEEB10. 2
16	Write laplace's equation and define laplace operator.	Remember	CO 1	AEEB10. 3
17	Give the importance of electro-statics in field analysis.	Understand	CO 1	AEEB10. 2

18	Define electric flux density and write its expression	Remember	CO 1	AEEB10. 2
19	Differentiate between dot product and cross product.	Understand	CO 1	AEEB10. 1
20	Convert Cartesian co-ordinates to cylindrical co-ordinates.	Remember	CO 1	AEEB10. 1
21	Convert Cartesian co-ordinates to spherical co-ordinates.	Remember	CO 1	AEEB10. 1
PART – B (LONG ANSWER QUESTIONS)				
1	State and explain COLOUMB's law in detail .	Understand	CO 1	AEEB10. 3
2	Derive the expressions for electric field intensity due to line and surface charge distribution.	Understand	CO 1	AEEB10. 1
3	Prove the divergence of flux density is equal to volume charge density	Understand	CO 1	AEEB10. 3
4	Derive the POISSON's equation and deduce LAPLACE's equation.	Understand	CO 1	AEEB10. 3
5	State and prove Guass law. Write its importance in electro-magnetic fields.	Understand	CO 1	AEEB10. 3
6	Explain the concept of electric field intensity and potential gradient derive the relevant expressions of both.	Understand	CO 1	AEEB10. 1
7	Derive the expressions for electric field intensity and work done on point charge.	Understand	CO 1	AEEB10. 1
8	Explain the MAXWELL's curl equation for static electric field.	Understand	CO 1	AEEB10. 3
9	Give the solution of laplace equation in spherical co-ordinates.	Understand	CO 1	AEEB10. 3
10	Give the solution of laplace equation in cylindrical co-ordinates.	Understand	CO 1	AEEB10. 3
11	Give the solution of laplace equation in rectangular co-ordinates.	Understand	CO 1	AEEB10. 3
12	Explain electric field, electric field intensity and electric field due to point charge.	Understand	CO 1	AEEB10. 1
PART – C (ANALYTICAL QUESTIONS)				
1	A charge Q2 = $121*10^{-9}$ C is located in vaccum at P2(-0.03,0.01,-0.04)m. Find force on Q2 due to Q1 = 100μC at P1(0.03,0.08,0.02)m	Understand	CO 1	AEEB10. 1
2	Determine the potential at (0,0,4)m caused by a total charge 10^{-8} C distributed uniformly along a disc of radius 4m lying in the z = 0 plane and centered at origin.	Understand	CO 1	AEEB10. 1
3	Three equal point charges of 2μC are in free space at (0,0,0,), (2,0,0,) and (0,2,0) respectively. Find net force on Q4 = 5μC at (2,2,0).	Understand	CO 1	AEEB10. 1
4	Calculate electric field E at point P(3,-4,2) in free space caused by A) a charge Q1 = 4μC at N1(0,0,0) . B) a charge Q2 = 2μC at N2(-1,2,4).	Understand	CO 1	AEEB10. 1
5	Find the work done in moving a point charge 5μC from (4,π,0) to (6,π,0) in the field of Vector(E) = 10^6 /p ap + 10^4 /p az	Understand	CO 1	AEEB10. 1
6	Given a field Vector(E) = $(-6y/x^2)$ax + (6/x)ay + 5 az v/m. calculate the potential difference VAB given A(-7,2,1) and B(4,1,2).	Understand	CO 1	AEEB10. 1

7	Obtain the relation between electric field strength and potential. The potential is given as $V = 80x^{0.6}$ V. Assuming free space conditions, find: i) E ii) Find E if the volume charge density at $\rho = 0.5$ C/m3	Understand	CO 1	AEEB10. 1
8	Planes x=2 and y=3 respectively carry charges 10 nC/m^2 and 15 nC/m^2 . If the line x=0, Z=2 carries charge 10π nC/m. Calculate E at (1,1,-1) due to the 3 charge distributions.	Understand	CO 1	AEEB10. 1
9	Determine whether or not the following potential field satisfy the Laplace equation: (i)$V = x^2 - y^2 + z^2$ (ii) $V = r\cos\Phi + z$	Understand	CO 1	AEEB10. 3
UNIT – II CONDUCTORS AND DIELECTRICS				
PART – A (SHORT ANSWER QUESTIONS)				
1	Explain formation of di-pole in electro-magnetic fields.	Understand	CO 2	AEEB10. 5
2	Define dipole moment and deduce its expression.	Remember	CO 2	AEEB10. 5
3	Write the expression for electric potential due to dipole.	Remember	CO 2	AEEB10. 5
4	Deduce the expression for electric field due to dipole.	Remember	CO 2	AEEB10. 5
5	Write the expression for torque on electric dipole.	Remember	CO 2	AEEB10. 5
6	Define capacitor, capacitance and write its importance.	Remember	CO 2	AEEB10. 6
7	What is the property of capacitor and write the expression for it?	Remember	CO 2	AEEB10. 6
8	Give the expression for capacitance of isolated sphere.	Remember	CO 2	AEEB10. 6
9	What amount of the capacitance is offered by spherical sphere?	Remember	CO 2	AEEB10. 6
10	Explain the capacitance of capacitor with two parallel plates.	Remember	CO 2	AEEB100.6
11	Deduce the capacitance between the parallel plates with two dielectrics.	Remember	CO 2	AEEB10. 6
12	Write the capacitance of co-axial cable.	Remember	CO 2	AEEB10. 6
13	Give the expression for energy stored in capacitor.	Remember	CO 2	AEEB10. 6
14	Write the expression for energy density in a static electric field.	Remember	CO 2	AEEB10. 6
15	Define conductor and write its importance.	Remember	CO 2	AEEB10. 4
16	Define insulator and write its importance.	Remember	CO 2	AEEB10. 4
17	Define polarization and give the importance of polarization.	Understand	CO 2	AEEB10. 4
18	Deduce the expression for dielectric polarization.	Remember	CO 2	AEEB10. 4
19	Define dielectric constant.	Remember	CO 2	AEEB10. 4
20	Define current density.	Remember	CO 2	AEEB10. 4
21	State conduction current density.	Remember	CO 2	AEEB10. 4

22	Explain point form of ohm's law using current density.	Remember	CO 2	AEEB10. 4
PART – B (LONG ANSWER QUESTIONS)				
1	Explain formation of electric dipole and deduce expression for dipole moment.	Understand	CO 2	AEEB10. 5
2	Derive the expression for electric potential due to dipole.	Understand	CO 2	AEEB10. 5
3	Obtain the expression for electric field due to dipole.	Understand	CO 2	AEEB10. 5
4	Extract the expression for torque on an electric dipole in an electric field.	Understand	CO 2	AEEB10. 5
5	Explain the element capacitor properties and its importance.	Understand	CO 2	AEEB10. 6
6	Derive the expression for capacitance between parallel plate.	Understand	CO 2	AEEB10. 6
7	Obtain the expression for capacitance of the spherical condenser.	Understand	CO 2	AEEB10. 6
8	Find the capacitance of a two concentric spherical shells.	Understand	CO 2	AEEB10. 6
9	Extract the expression for capacitance of the cylindrical condenser.	Understand	CO 2	AEEB10. 6
10	Deduce the expression for capacitance between parallel plate with two dielectrics.	Understand	CO 2	AEEB10. 6
11	Explain and derive the expression for energy stored in capacitor.	Understand	CO 2	AEEB10. 6
12	Obtain the expression for energy density in a static electric field.	Understand	CO 2	AEEB10. 6
13	Derive the expression for energy stored in parallel plate capacitor.	Understand	CO 2	AEEB10. 6
14	State and derive the expression for equation of continuity.	Understand	CO 2	AEEB10. 4
15	Deduce the point form of ohm's law from current density.	Understand	CO 2	AEEB10. 4
16	Explain polarization and prove that its value equal to volume density.	Understand	CO 2	AEEB10. 4
17	Derive the expression for Guass law in dielectrics.	Understand	CO 2	AEEB10. 4
PART – C (ANALYTICAL QUESTIONS)				
1	Calculate the capacitance of a parallel plate capacitor with the following details: Plate area = 150 cm^2, dielectric ϵ_{r1} = 5, d_1 = 3 mm, ϵ_{r2} = 4, d_2 = 4 mm. If 220V is applied across plates, what will be the voltage gradient across each dielectric?	Understand	CO 2	AEEB10. 6
2	Predict the capacitance of a capacitor of two parallel plates 30cm by 30cm, separated by 5mm in air. Calculate the energy stored by the capacitor if it is charged to a potential difference of 500V?	Understand	CO 2	AEEB10. 6
3	The capacitance of the capacitor formed by two parallel plates, each 100cm^2 in area separated by a dielectric 2mm thickness is $2*10^{-4}$. A potential difference of 20KV is applied. Determine Total dielectric flux in coloumbs The potential gradient in KV/m. The relative permeability of the material.	Understand	CO 2	AEEB10. 6

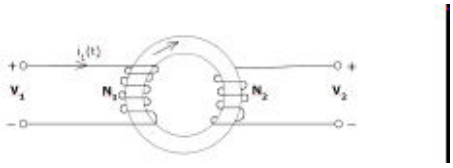
4	The capacitance of the capacitor formed by two parallel plates, each 50cm^2 in area separated by a dielectric 1 mm thickness are. if 100 micro joules of energy required to increase the distance between the plates to 3 mm, calculate the initial and final voltage across the plates. Assume perfect insulation.	Understand	CO 2	AEEB10. 6
5	The capacitance of the capacitor formed by two parallel plates, each 1.5m^2 in area separated by a dielectric 5 mm thickness. There are two dielectrics in between the plates. The first dielectric has a thickness of 3mm with a relative permeability of 6 and second dielectric has a thickness of 2mm with a relative permeability of 4. Calculate capacitance and derive formula used.	Understand	CO 2	AEEB10. 6
6	A parallel plate capacitor has a separation of 1cm. A thin piece of glass with εr = 6.5 and thickness 0.2cm is inserted between the plates. The dielectric strength of air is 30 kV/cm and that of glass is 290 kV/cm. If 29 kV is applied across the capacitor find whether glass or air will breakdown.	Understand	CO 2	AEEB10. 6
7	A conducting wire of diameter 1mm and conductivity 5x107 S/m, has 1029 free electrons/m3 when an electric field of 10mV/m is applied. Determine (i) The charge density of free electrons (ii) The current density (iii) The current in the wire	Understand	CO 2	AEEB10. 4
	UNIT – III **MAGNETOSTATICS**			
	PART – A (SHORT ANSWER QUESTIONS)			
1	Explain the magnetic flux and its direction.	Understand	CO 3	AEEB10. 7
2	Define magnetic flux density.	Remember	CO 3	AEEB10. 7
3	Define magnetic flux intensity.	Remember	CO 3	AEEB10. 7
4	Obtain the relation between magnetic flux density and intensity.	Remember	CO 3	AEEB10. 7
5	What is the role of permeability in the magnetic circuit?	Understand	CO 3	AEEB10. 7
6	Define intensity of magnetization.	Remember	CO 3	AEEB10. 7
7	Define K.	Remember	CO 3	AEEB10. 7
8	Extract the relation between B, H, I and I.	Remember	CO 3	AEEB10. 7
9	State Biot-savart's law and write its application.	Remember	CO 3	AEEB10. 7
10	Write the expression for magnetic field intensity of entire conductor.	Remember	CO 3	AEEB10. 8
11	Write the expression for magnetic field intensity of solenoid.	Remember	CO 3	AEEB10. 8
12	Write ampere's circuital law and its importance.	Remember	CO 3	AEEB10.9
13	Deduce the expressions for H and B of toroid.	Remember	CO 3	AEEB10. 8
14	Obtain the expression for magnetic flux in general.	Remember	CO 3	AEEB10.7
15	Find the expression for magnetic field intensity of a long current carrying conductor.	Remember	CO 3	AEEB10. 8

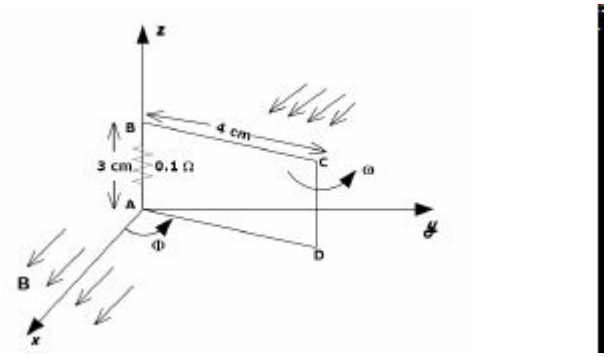
16	Write the ampere's circuital law in differential form.	Remember	CO 3	AEEB10.9
17	Deduce the integral form of the ampere's circuital law .	Remember	CO 3	AEEB10.0
18	Mention the applications of ampere's circuital law	Understand	CO 3	AEEB10.9
19	Write the MAXWELL's third equation.	Remember	CO 3	AEEB10.9
20	Calculate the magnetic flux density at the center of a current carrying loop when the radius of loop is 2cm, loop current is 1mA and loop is placed in air.	Understand	CO 3	AEEB10.7
PART – B (LONG ANSWER QUESTIONS)				
1	Define magnetic induction, magnetic field, magnetic flux density, magnetic field intensity, permeability and magnetic susceptibility.	Remember	CO 3	AEEB10.7
2	State and explain importance of Bio-Savart's law electro-magnetic fields.	Understand	CO 3	AEEB10.7
3	Using Bio-Savart's law find the expression for magnetic field intensity due to a long current carrying conductor.	Understand	CO 3	AEEB10.7
4	With help of Bio-Savart's law find the expression for magnetic field intensity at any point on the axis of a circular current carrying coil.	Understand	CO 3	AEEB10.7
5	Using Bio-Savart's law find the expression for magnetic field intensity due to a circular current loop.	Understand	CO 3	AEEB10.7
6	Extract the expression for maxwell's second equation.	Understand	CO 3	AEEB10. 8
7	Using Bio-Savart's law find the expression for magnetic field intensity inside a long solenoid carrying current I.	Understand	CO 3	AEEB10.7
8	Show that the magnetic field intensity at the end of solenoid is half of that in middle.	Understand	CO 3	AEEB10. 8
9	Deduce the expression of maxwell's third equation.	Understand	CO 3	AEEB10. 08
10	State and explain importance of ampere's circuital law .	Understand	CO 3	AEEB10.09
11	Explain any two applications of ampere's circuital law.	Understand	CO 3	AEEB10.09
12	Determine the magnetic field intensity using ampere's circuital law due to an infinite sheet of current.	Understand	CO 3	AEEB10.09
13	Determine the magnetic field intensity using ampere's circuital law due to long current carrying conductor.	Understand	CO 3	AEEB10.09
PART – C (ANALYTICAL QUESTIONS)				
1	A circular coil of radius 1of 1.5cm carries a current 1.5A, if the coil has 25 turns , find the field at the center.	Understand	CO 3	AEEB10. 8
2	A steady current I amperes flows in a conductor bent in the form of circular. Find the magnetic field at the center of the loop.	Understand	CO 3	AEEB10. 8
3	A steady current I amperes flows in a conductor bent in the form of square loop of side a. Find the magnetic field at the center of the loop.	Understand	CO 3	AEEB10. 8
4	A uniform solenoid 100mmbin diameter and 400mm long has 100 turns of wire and a current of I = 3A . fid the magnetic field on the axis of the solenoid a) at the center b) at on end c) half the way.	Understand	CO 3	AEEB10. 8

5	A current of 1A is flowing in a circular coil of radius 10cm and 20 turns. Calculate the intensity of magnetic field at a distance 10cm on the axis of the coil and at the centre.	Understand	CO 3	AEEB10. 8
6	State Biot-Savart's Law. Given points C(5,−2, 3) and P(4,−1, 2); a current element IdL = 10^{-4} [4ax − 3ay + az]Am at C produces a field dH at P. Find dH.	Understand	CO 3	AEEB10. 7
7	The magnitude of H at a radius of 1m from a long linear conductor is 1A/m. Determine current in the wire.	Understand	CO 3	AEEB10. 8
8	Calculate the magnetic flux density at the center of a current carrying loop when the radius of loop is 2cm, loop current in 1mA and loop is paced in air.	Understand	CO 3	AEEB10. 8
9	A current of 1A is flowing in a circular coil of radius 10cm and 20 turns. Calculate the intensity of magnetic field at a distance 10cm on the axis of the coil and at the centre.	Understand	CO 3	AEEB10. 8
10	A circular loop located on $X^2 + Y^2 = 9$, Z = 0, carries a direct current of 10 Amps along U_O. Find H at (0,0,4) and (0,0,-4).	Understand	CO 3	AEEB10. 7
	UNIT – IV **FORCE IN MAGNETIC FIELD AND MAGNETIC POTENTIAL**			
	PART – A (SHORT ANSWER QUESTIONS)			
1	Obtain the Lorentz force equation.	Remember	CO 4	AEEB10.10
2	Write the expression for force on straight current carrying conductor in an magnetic field.	Remember	CO 4	AEEB10.10
3	Extract the expression for force between two straight long and parallel current carrying conductors.	Remember	CO 4	AEEB10.10
4	Find the expression for force on infintely long current carrying conductor in an magnetic field.	Remember	CO 4	AEEB10.10
5	Give the expression for induced emf in the coil or conductor.	Remember	CO 4	AEEB10.12
6	Write the transformer induction equation.	Remember	CO4	AEEB10.12
7	Give the expression for motional induced emf.	Remember	CO 4	AEEB10.12
8	Obtain the expression for torque on a current loop placed in a magnetic field.	Remember	CO 4	AEEB10.10
9	Deduce the field form of Ampere's law	Remember	CO 4	AEEB10.11
10	Express the magnetic field intensity in terms of scalar magnetic potential.	Remember	CO 4	AEEB10.11
11	Where the concept of scalar magnetic potential is valid?	Understand	CO 4	AEEB10.11
12	Express magnetic flux density in terms of magnetic potential.	Remember	CO 4	AEEB10.11
13	Find the poisson's equation in magneto-statics.	Remember	CO 4	AEEB10.11
14	Obtain scalar poisson's equations.	Remember	CO 4	AEEB10.11
15	Give the self inductance of a solenoid.	Remember	CO 4	AEEB10.12
16	Write the self inductance of a toroid.	Remember	CO 4	AEEB10.12

17	Give the Neumann's formula for mutual inductance.	Remember	CO 4	AEEB10.12
18	Extract the expression for energy stored in magnetic field.	Remember	CO 4	AEEB10.12
19	Write the expression for energy density in a magnetic field.	Remember	CO 4	AEEB10.12
PART – B (LONG ANSWER QUESTIONS)				
1	Explain the motion of charged particle in magnetic field.	Understand	CO 4	AEEB10.10
2	Derive the expression for Lorentz force equation.	Understand	CO 4	AEEB10.10
3	Obtain the expression for force on straight current carrying conductor in an magnetic field.	Understand	CO 4	AEEB10.10
4	Determine the expression for force between two current carrying conductor in an magnetic field.	Understand	CO 4	AEEB10.10
5	Obtain the expression for the torque on a current loop placed in a magnetic field.	Understand	CO 4	AEEB10.10
6	Explain the concept of scalar and vector magnetic potential along with their expressions.	Understand	CO 4	AEEB10.11
7	Derive the expression for vector magnetic potential, A which satisfies the vector poisson's equation.	Understand	CO 4	AEEB10.11
8	Define and explain self and mutual inductance.	Understand	CO 4	AEEB10.12
9	Determine the expression of self-inductance of solenoid.	Understand	CO 4	AEEB10.12
10	Obtain the expression of self-inductance of toroid.	Understand	CO 4	AEEB10.12
11	Find the expression for mutual inductance M.	Understand	CO 4	AEEB10.12
12	Derive the expression for energy stored and energy density in a magnetic field.	Understand	CO 4	AEEB10.12
PART – C (ANALYTICAL QUESTIONS)				
1	Derive an expression for H at the centre of a circular wire carrying a current I in the anti-clockwise direction. The radius of the circle is a and the wire is in xy plane.	Understand	CO 4	AEEB10.11
2	A circular coil of radius 1of 1.5cm carries a current 1.5A, if the coil has 25 turns, find the field at the center.	Understand	CO 4	AEEB10.10
3	Two long parallel conduction carrying 100A. If the conductors are separated by 200mm. Find the force per meter of each conductor if the current flow direction is in opposite direction.	Understand	CO 4	AEEB10.12
4	Two coils A and B with 800 turns and 1200 turns respectively, have a common magnetic circuit. A current of 0.5A in A will produce a flux of 3mwb and 80% of the flux links with coil B. calculate self inductance of each coil and mutual inductance.	Understand	CO 4	AEEB10.12
5	What is the maximum torque on a square loop of 100 turns in a field of uniform flux density B = 1wb/mt2. The loop has 10cm side and carries a current of 3A. What is the magnetic moment of the loop?	Understand	CO 4	AEEB10.12

6	A toroidal coil of 500 turns is wound on a steel ring of 0.5m. Mean diameter and $2*10^{-2}$ m^2 cross sectional area. An excitation of 4000A/m produces a flux density of 1 tesla. Compute the inductance of the coil. If a 10mm long gap is cut in the ring, determine the current required to maintain the flux density at 1 tesla. Also find the inductance under these new conditions.	Understand	CO 4	AEEB10.12
7	Two mutually coupled coils are connected in series with L1 = 0.5H, L2 = 0.6H and M = 0.1H. , current flowing through it is increasing at rate of 1A/sec. Derive the expression for voltage induced in coils i) When they in series aiding connection. ii) When they in series opposite connection.	Understand	CO 4	AEEB10.12
8	A solenoid with 300 turns is 300 mm long and 30mm in diameter. If the current is 500mA. Calculate i) Inductance ii) Energy stored in solenoid. Assume μr = 1.	Understand	CO 4	AEEB10.12
9	A Rectangular loop of wire in free space joins points A(1, 0, 1) to B(3, 0, 1) to C(3, 0, 4) to D(1, 0, 4) to A. The wire carries a current of 6 mA, flowing in the a_z direction from B to C. A filamentary current of 15 A flows along the entire z axis in the a_z direction. Find F on side BC.	Understand	CO 4	AEEB10.12
10	Find the torque vector on a square loop having corners (-2,-2,0), (2,-2,0), (2,2,0) and (-2,2,0) about the origin by $B = 0.6a_x - 0.4a_y$ T when a current of 0.5A is flowing through the loop.	Understand	CO 4	AEEB10.10
	UNIT – V **TIME VARYING FIELDS AND FINITE ELEMENT METHOD**			
	PART – A (SHORT ANSWER QUESTIONS)			
1	State faraday's law of electro-magnetic induction.	Remember	CO 5	AEEB10.13
2	Determine the expression for emf induced.	Remember	CO 5	AEEB10.13
3	Obtain the MAXWELL's equations for static fields.	Remember	CO 5	AEEB10.14
4	Write the MAXWELL's equations for static fields in integral form.	Remember	CO 5	AEEB10.14
5	Deduce the MAXWELL's equations for time varying fields.	Remember	CO 5	AEEB10.14
6	Give the MAXWELL's equations for time varying fields in integral form.	Remember	CO 5	AEEB10.14
7	Write the MAXWELL's equations for hormonically varying fields.	Remember	CO 5	AEEB10.14
8	obtain the MAXWELL's equations for time hormonically fields in integral form.	Remember	CO 5	AEEB10.14
9	Find the expression for statically induced emf.	Remember	CO 5	AEEB10.13
10	Determine the expression for dynamically induced emf.	Remember	CO 5	AEEB10.13
11	Deduce the expression for displacement current density.	Remember	CO 5	AEEB10.13
12	Write the expression for induced emf from Faraday's disc generator.	Remember	CO 5	AEEB10.13
13	Find the expression for wave equation.	Remember	CO 5	AEEB10.15
14	State and explain skin effect.	Remember	CO 5	AEEB10.15
15	State and explain poynting theorem.	Remember	CO 5	AEEB10.15
16	Explain wave equations in conductor and insulator.	Remember	CO 5	AEEB10.15

PART – B (LONG ANSWER QUESTIONS)				
1	Explain the Faraday's law of electro-magnetic induction and derive the expression for induced emf.	Understand	CO 5	AEEB10.13
2	Derive the expression for one of the Maxwell's equation.	Understand	CO 5	AEEB10.14
3	Explain about induced emf and derive the expression for statically and dynamically induced emf.	Understand	CO 5	AEEB10.13
4	Derive the expression from modified Ampere law.	Understand	CO 5	AEEB10.14
5	Explain Faraday's Disc Generator with neat sketch and derive the expression for induced emf.	Understand	CO 5	AEEB10.13
6	Explain the complete concept of displacement currents.	Understand	CO 5	AEEB10.14
7	Write and explain differential and integral form of Maxwell's equation.	Understand	CO 5	AEEB10.14
8	Write and explain differential and integral form of Maxwell's equation for fields varying harmonically with time	Understand	CO 5	AEEB10.14
9	Obtain the wave equation from the MAXWELL's equations in free space.	Understand	CO 5	AEEB10.15
10	Explain propagation of plane wave in good conductor along with skin effect.	Understand	CO 5	AEEB10.15
11	State and explain POYNTING theorem in detail in electromagnetic fields.	Understand	CO 5	AEEB10.15
12	Disccuss on the propagation of wave in the dielecrics.	Understand	CO 5	AEEB10.15
PART – C (ANALYTICAL QUESTIONS)				
1	A square loop of wire 25cm * 25cm is placed in an alternating field with the maximum intensity of 1A/m. If the plane of the loop is perpendicular to the magnetic field and varying at a frequency of 10MHz. Find induced enf in the loop.	Understand	CO 5	AEEB10.14
2.	Determine the conduction and displacement current densities in a material having conductivity of 10^{-3} s/m and $\epsilon r = 2.5$ if the electric field in material is , $E = 5.8*10^{-6} \sin(9.0*10^{9}t)$ V/m.	Understand	CO 5	AEEB10.14
3	A conductor of length 100cm moves at right angles to a uniform field of strength 10000 lines per cm^2 , with a velocity of 50 meters/sec. Calculate the emf induced in it. Compute also the value of the induced emf when the conductor moves at an angle of 30 degrees to the direction of the field.	Understand	CO 5	AEEB10.14
4	In a material for which $\sigma = 5.0(\Omega m)^{-1}$ and $\sigma r = 1$ the electric field intensity is $E = 250\sin(10^{10}t)$ V/m. Calculate the conduction and displacement current densities and the frequency at which they have equal magnitudes.	Understand	CO 5	AEEB10.14
5	The magnetic circuit has a uniform cross-section of $10{-}3m^2$ .If the circuit is energized by a current $i_1 = 3 \sin 100\pi t$ Amperes in the coil of N_1=200 TURNS. Find the emf induced in the coil of N_2=100 TURNS. Assume that μ=500 μ_0 	Understand	CO 5	AEEB10.13

6	The loop shown in Figure 3 is inside a uniform magnetic field B = 50Ux mW b /m^2 . If side DC of the loop cuts the flux lines at frequency of 50Hz and the loop lies in yz-plane at time t=0. Find induced EMF at t=1ms.  	Understand	CO 5	AEEB10.13

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