Code No: R2021025 **R20** SET - 1

II B. Tech I Semester Regular Examinations, Feb/March - 2022
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1	a)	State Coulomb's law of force between any two point charges.	[7M]
	b)	Derive the expression for the total force experienced by a point charge due to infinite number to point charges around it.	[7M]
		Or	
2	a)	Derive Maxwell's first equation as applied to the electrostatics using Gauss law.	[7M]
	b)	A finite charge of 45 nC is uniformly distributed along positive z-axis. Two point charges of 75 nC are located at (3,0,0) and (0,3,0). Find the potential difference PQ if P is at (3,4,0) and Q is at (5,4,3).	[7M]
3	a)	Obtain the expression for torque on an electric dipole in an electric field.	[7M]
	b)	Derive the expression for electric potential due to a dipole.	[7M]
		Or	
4	a)	Derive the Ohm's law in point form.	[7M]
	b)	A parallel plate capacitor consists of two square metal plates with 500mm side and separated by 10 mm. A slab of super ($\varepsilon_r = 4$) 6 mm thick is placed on the lower side of plate and air gap of 4 mm. Calculated 1ha capacitance of capacitor.	[7M]
5	a)	Obtain the expression for the magnetic field intensity due to infinite length current carrying conductor.	[7M]
	b)	A filamentary current of 10A is directed in from infinity to the origin on the positive x axis, and then back out to infinity along the position y axis. Use the Biot-Savarts law of find $\overline{H}$ at P (0, 0,1) ?	[7M]
		Or	
6	a)	Show that the field strength at the end of a long solenoid is one-half of that at the centre.	[7M]
	b)	Derive the expression for force on a straight current carrying conductor place in a magnetic field.	[7M]
7	a)	Derive an expression for mutual inductance using Newmann's formula.	[7M]
	b)	A toroid has 600 turns of coil, circular cross section of 6 cm^2 and a mean diameter of 38 cm. The permeability of the toroid is 1000. Calculate the inductance of the coil.	[7M]
		Or	
8	a)	Derive the expression for energy stored in a magnetic field	[7M]
	b)	A solenoid of 500 turns has a length of 50 cm and radius of 10 cm. A steel rod of circular cross section is fitted in the solenoid coaxially and tightly. The relative permeability of steel is 3000. A dc current of 10 A is passed through the solenoid. Compute the inductance of the system, energy stored in the system and the mean flux density inside the solenoid.	[7M]
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9 a) State and explain the Faraday's laws of electromagnetic induction. [7M]

b) From the Maxwell's equations, derive the expression for Poynting vector. Also, explain the applications of the poynting vector. [7M]

Or

10 a) Obtain the Maxwell's equations for conducting medium in integral and point forms. [7M]

b) Derive the expression for one of the Maxwells equations, $\nabla \times E$, for time varying fields. [7M]