R20

SET - 1

II B. Tech I Semester Supplementary Examinations, July - 2022
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

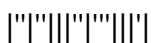Time: 3 hours   Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1	a)	Derive the concept of electric field intensity from Coulomb's law.	[7M]
	b)	Two point charges Q_1 = 250 µC and Q_2 = 300 µC are located at (5,0,0) m and (0,0,-5) m respectively. Determine the force on Q_1.	[7M]

Or

2	a)	Derive the equation for potential at a point inside a solid sphere having uniformly charge density.	[7M]
	b)	A spherical volume R =1m has a uniform charge density of ρ= 1 C/m^3. Calculate the potential V at r = 50 cm.	[7M]

3	a)	Explain the behavior of conductors in an electric field.	[7M]
	b)	Find the potential due to an electric dipole consisting of +Q at (a/2, 0,0) and –Q at (-a/2,0,0) at a distance point (r, θ,ϕ) in spherical coordinates.	[7M]

Or

4	a)	Derive the expression for equation of continuity.	[7M]
	b)	The capacitance of a capacitor formed by two parallel metal plates each 200 cm^2 in area separated by a dielectric 4 mm thick is 4 x 10^{-4}µF. A P.D. of 20 KV is applied. Determine (i) the potential gradient (ii) Total charge on the plates (iii) Electric flux density and (iv) relative permittivity of dielectric.	[7M]

5	a)	Obtain the expression for the magnetic field intensity due to finite length current carrying conductor.	[7M]
	b)	Write the similarities between electrostatic field and magnetic field.	[7M]

Or

6	a)	Derive an expression for magnetic field at the centre of bridal coil.	[7M]
	b)	Obtain the expression for Lorentz force equation.	[7M]

7	a)	Obtain the expression for inductance of a toroid.	[7M]
	b)	The current in a coil is increased from zero to 15 A at a uniform rate in 6 sec. It is found that this coil develops self induced emf of 150V, where as emf of 25 V is produced in a neighboring coil. Compute the self inductance of the first coil and the mutual inductance between the two coils.	[7M]

Or

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8. a) Derive the expression for coefficient of coupling between two coils. [7M]
    b) A solenoid with 300 turns is 300 mm long and 30 mm in diameter. If the current [7M]
flowing through it is 500 mA, find (i) inductance and (ii) energy stored in
solenoid. Assume $\mu_r = 1$.

9. a) Derive the Maxwell's equation for free space in integral and point form. [7M]
    b) Discuss the physical interpretation of Maxwell's equations. [7M]

<div align="center">Or</div>

10. a) State and explain Poynting theorem. [7M]
    b) Find the displacement current density within a parallel plate capacitor having a [7M]
dielectric with $\varepsilon_r = 10$, area of plates S = 0.01 m^2, distance of separation,
d =0.05mm, applied voltage is V = 200 Sin 200t.

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