Code: 1G234

II B.Tech. I Semester Supplementary Examinations November 2019
Electromagnetic Fields
(Electrical and Electronics Engineering)

Max. Marks: 70   Time: 3 Hours

Answer any **five** questions
All Questions carry equal marks (**14 Marks** each)
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1. a)	State Gauss's law and derive it in Point form.	7M
b)	Determine the force between the two charges Q_1=4 nC and Q_2= 8 nC separated by a distance of 2 meters apart.	7M
2. a)	Derive the expression for Potential and EFI due to an electric dipole.	7M
b)	Given a field E = $\left(\frac{-8y}{x^2}\right) a_x + \left(\frac{8}{x}\right) a_y + 10a_z$ V/m. Calculate the potential difference between the two points A (-8, 4, 2) and B (5, 2, 3) situated in the field.	7M
3. a)	Derive the expression for capacitance of a co-axial capacitor.	7M
b)	Determine whether the following potential field satisfies the Laplace's equation or not? (i)V= $2x^2$+2y-$3z^2$ (ii) V= r cos(∅) + z	7M
4 a)	Derive the expression for MFI at a point on magnetic field produced by a circular current carrying wire.	7M
b)	A current element $Idl = 8\pi(0.8a_x - 0.9a_y)$μA-m is situated at a point (6, -4, 5). Find the incremental field △H at a point (2, 6, 4) using Biot- Savart's law,	7M
5. a)	Derive the point form of Ampere's Circuit law.	7M
b)	In the magnetic field intensity is H= x^2 a_x + 3yz a_y + (-x^3) a_z A/m. Find the Current density at a point (i) (1,2,3) in cartesian (ii) r = 5, ∅ = 60° , z = 4 in cylindrical (iii) r = 4, = 45°, ∅ = 90° in spherical	7M
6. a)	Derive Lorentz's force equation.	6M
b)	What is the maximum torque on a square loop of 800 turns placed in a field of uniform flux density 2 tesla. The loop has 10 cm side and carries a current of 6 Amperes? What is the magnetic dipole moment of the loop?	8M
7. a)	Derive the expression for energy stored and density in magnetic field.	7M
b)	A solenoid of 10 cm in length consists of 1000 turns having the cross-sectional radius of 1cm. Find the inductance of solenoid. What is the value of current required to maintain a flux of 1mwb in the Toroid. Take μ_r = 1500.	7M
8 a)	Derive the Point form and Integral form of Maxwell's fourth equation.	7M
b)	What is Displacement current? Find the Conduction Current and Displacement Current densities in a material having conductivity of 10^{-2} s/m and $_r$ = 2.0, if the electric field in the material is E = $5.0×10^{-6}$ Sin ($9.0×10^9$) V/m.	7M

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