

Question 1 is compulsory. Answer one from 2 or 3 and one from 4 or 5.

	Question	Marks	Unit	CO	Cognitive Level
1.a)	Define the term electric field intensity and mention the units.	2	I	C209.1	Remember
1.b)	Write the capacitance of a spherical capacitor with inner radius 'a' and outer radius 'b'.	2	II	C209.2	Remember
1.c)	What do you mean by electric potential and mention the units.	2	I	C209.1	Understand
1.d)	State Ohm's law in electro static fields.	2	II	C209.2	Remember
1.e)	State divergence theorem.	2	I	C209.1	Remember
2.a)	State and explain Coulomb's Law of electrostatic field in vector form.	5	I	C209.1	Understand
2.b)	Point charges 3 mc and -5 mc are located at (4, 2, -1) and (-2, -1, 4) respectively. Calculate the electric force on a 15 nC charge located at (0, 4, 1).	5	I	C209.1	Apply
3.a)	State and explain Gauss's Law .	5	I	C209.1	Remember
3.b)	If $D = (3Y^2 + Z) \hat{a}_x + 5XY \hat{a}_y + X \hat{a}_z \text{ C/m}^2$, find the electric flux through the cube defined by $0 \leq X \leq 3$, $0 \leq Y \leq 3$, and $0 \leq Z \leq 3$.	5	I	C209.1	Apply
4.0)	Derive the expressions for potential and electric field intensity due to an electric dipole.	10	II	C209.1	Create
5.a)	Obtain the expression for capacitance of parallel plate capacitor with neat circuit diagram.	5	II	C209.2	Create
5.b)	A Parallel plate capacitor has a plate area of 1.5 m^2 and a plate separation of 5mm. There are two dielectrics in between the plates. The first dielectric has a thickness of 3mm with a relative permittivity is 6 and second has a thickness of 2mm with a relative permittivity is 4 find the capacitance.	5	II	C209.2	Apply

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Sub: Electro Magnetic Fields

Time: 1½ Hrs.

Date: 06-03-2018

Max Marks: 30M

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	Question	Marks	Unit	CO	Cognitive Level
1.a)	What do you mean by electric dipole and dipole moment.	2	II	C209.1	Understand
1.b)	Write the capacitance of a single isolated sphere of radius 'a'.	2	II	C209.2	Understand
1.c)	State Poisson's equation.	2	I	C209.1	Remember
1.d)	What is the main idea of statement of Gauss's Law.	2	I	C209.1	Remember
1.e)	Define Coulomb's Law.	2	I	C209.1	Remember
2.a)	Derive the expression for the electric field intensity due to a line charge.	5	I	C209.1	Create
2.b)	Four Point charges each of 10 μC are placed in free space at the points (1, 0, 0), (-1, 0, 0), (0, 1, 0) and (0, -1, 0) respectively. Determine the force on a point charge of 30 μC located at a point (0, 0, 1) m.	5	I	C209.1	Apply
3.a)	Prove that electric field intensity is equal to the negative gradient of the potential.	5	I	C209.1	Apply
3.b)	Determine whether or not the following potential fields satisfy the Laplace equation. (i) $V = 2X^2 - 3Y^2 + 4Z^2$ (ii) $V = r \sin\theta + 2Z$	5	I	C209.1	Apply
4.a)	State and explain the continuity equation of current in integral form and point form.	5	II	C209.2	Remember
4.b)	Explain and derive the boundary conditions for a conductor and free space interface.	5	II	C209.2	Understand
5.a)	Obtain the expression for capacitance of Co-axial cable with neat circuit diagram.	5	II	C209.2	Create
5.b)	A Parallel plate capacitor with air as dielectric has a plate area of $46 \pi \text{ Cm}^2$ and a separation between the plates of 2 mm. It is charged to 100 Volts by connecting it across a battery. If the battery is disconnected and plate separation is increased to 4 mm. Calculate the change in (i) Potential difference across the plates. (ii) Energy stored.	5	II	C209.2	Apply

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	Question	Marks	Unit	CO	Cognitive Level
1.a)	Define electric flux and electric flux density.	2	I	C209.1	Remember
1.b)	Write the capacitance of a co- axial cable capacitor with inner radius 'a' and outer radius 'b'	2	II	C209.2	Understand
1.c)	What is Polarization?	2	II	C209.2	Remember
1.d)	State divergence theorem.	2	I	C209.1	Remember
1.e)	What do you meant by potential gradient.	2	I	C209.1	Understand
2.a)	State and explain Coulomb's Law of electrostatic field in vector form.	5	I	C209.1	Remember
2.b)	Find the electric field intensity at origin due to a point charge of 65 nC located at (-4, 3, 2) in Cartesian co-ordinate systems.	5	I	C209.1	Apply
3.a)	Derive Poisson's and Laplace's equations.	5	I	C209.1	Create
3.b)	If $V = 2 X^2 Y + 20 Z - 4 / (X^2 + Y^2)$ Volts find electric field intensity at P (2, 3, 4).	5	I	C209.1	Apply
4.a)	Explain and derive the boundary conditions for a dielectric – dielectric interface.	5	II	C209.2	Understand
4.b)	Derive the expression for Ohm's law in point form.	5	II	C209.2	Create
5.a)	Obtain the expression for capacitance of spherical capacitor with neat circuit diagram.	5	II	C209.2	Create
5.b)	The co-axial cable is required to transmit electric power. The potential difference between the inner and outer conductors is to be filled mainly with nitrogen gas under pressure whose dielectric strength is $25 \mu V/m$ the radius of outer conductor is double that of inner conductor. (i) Determine the capacitance of cable per unit length. (ii) Determine the energy stored in the electric field of this cable when Potential difference is 200 KV.	5	II	C209.2	Apply

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	Question	Marks	Unit	CO	Cognitive Level
1.a)	Write the expression for electric field intensity due to a line charge and charged circular ring.	2	I	C209.1	Remember
1.b)	Find the force on charge $Q_1 = 450 \mu\text{C}$ located at (5, 0, 0) due to charge $Q_2 = 250 \mu\text{C}$ at (0, 4, 5) in free space.	2	I	C209.2	Apply
1.c)	State Laplace's equation.	2	I	C209.1	Remember
1.d)	A sample silver has a conductivity of the material is $\sigma = 6.17 * 10^7$ Mho/m. Determine the current density.	2	II	C209.1	Apply
1.e)	What is Polarization?	2	II	C209.2	Understand
2.a)	Derive the expression for the electric field intensity due to an charged circular ring.	5	I	C209.2	Create
2.b)	Three equal charges of $1 \mu\text{C}$ are placed at the corners of a square of length 10 cm. Find the direction and magnitude of electric field intensity at the vacant corner.	5	I	C209.1	Apply
3.a)	State and prove Gauss's Law.	5	I	C209.1	Remember
3.b)	A point charge of 6nC is located at origin in free space, Find potential of point P if P is located at (0.2, -0.4, 0.4) and (i) $V = 0$ at infinity. (ii) $V = 20$ volts at (-0.5, 1, -1).	5	I	C209.1	Apply
4.a)	Explain and derive the boundary conditions for a conductor and dielectric interface.	5	II	C209.2	Understand
4.b)	State and explain the continuity equation of current in integral form and point form.	5	II	C209.2	Remember
5.a)	Derive the expression for capacitance of composite parallel plate capacitor.	5	II	C209.2	Create
5.b)	Find the capacitance of a Parallel plate capacitor (i) When the plates are of area 1m^2 , distance between the plates 1 mm, voltage gradient is 100 KV/m and the surface charge density is $2 \mu\text{C}/\text{m}^2$. (ii) When the stored energy is 5 mille-joules and the voltage across the plates is 5 Volts.	5	II	C209.2	Apply

