Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART- A

(25 Marks)

1.a)	State Coulomb's law.	[2]
b)	What are the applications of Laplace's and Poison's equations?	[2]
c)	Define Magnetic flux and Magnetic flux density.	[2]
d)	State Faraday's laws of electromagnetic induction.	[2]
e)	What does Poynting vector signify?	[2]
f)	Define the electric field intensity and write the equation for a point charge.	[3]
g)	Show that the displacement current in the dielectric of parallel-plate capacitor is equal to the conductor current in its leads.	[3]
h)	Determine the force per meter length between two long parallel wires A and B separated by 5 cm in air and carrying currents of 40 A, in the same direction and in the opposite direction.	[3]
i)	What is meant by displacement current?	[3]
j)	What is meant by intrinsic impedance of a medium?	[3]

PART-B

(50 Marks)

2.a) Obtain the expression for electric field intensity on the axis of a uniformly charged circular disc.

b) In cylindrical coordinates, V= 60V at ρ = 6 mm and V=0 at ρ =66 mm. Find the voltage at ρ =140 mm, if the potential depends only on ρ. [5+5]

OR

3.a) State and prove Gauss's law and write limitations of gauss law.

b) A line charge density is uniformly distributed over a length of '2a' with centre as origin along x axis. Find E at a point 'p' which is on the z-axis at a distance 'd'. [5+5]

4.a) Derive the continuity equation. What is its physical significance?

b) Four 0.8 nC point charges are located in free space at the corners of a square 4 cm on a side. (i) Find the total potential energy stored. (ii) A fifth 0.8 µC charge is installed at the centre of the square. Again find the total energy stored. [5+5]

OR

5.a) Derive Poisson's and Laplace's equations.

b) Distinguish between conductors and dielectrics. Mention the materials commonly used as conductors and dielectrics. [5+5]

6.a) Derive the expression for magnetic field due to an infinitely long straight filament carrying a direct current 'I' by using Biot – Savart's law.

b) Derive the expression for Torque on a current loop placed in magnetic field.　　[5+5]

OR

7.a) Using Biot-savart law, find H on axis of circuits loop.

b) Calculate the magnetic flux density due to a coil of 100 A and area 50 cm^2.

i) On the axis of the coil at a distance of 10 m from centre and

ii) At a point 10 m in a direction at right angles to the axis.　　[5+5]

8.a) State Maxwell's equation for static fields. Explain how they are modified for time varying electric and magnetic fields.

b) Distinguish between conduction and displacement currents.　　[5+5]

OR

9.a) Explain about induced emf and derive the expressions for statically and dynamically.

b) Find the displacement current density within a parallel plate capacitor having a dielectric with $\varepsilon_r=10$, area of plates A = 0.01 m^2, distance of separation d= 0.05 mm, applied voltage is V=200 sin 200 t.　　[5+5]

10.a) Derive the Poynting vector from Maxwell's equation for the general case.

b) Derive the expressions for wave equations in electric field in free space.　　[5+5]

OR

11.a) Compare Maxwell Equations for free space and sinusoidal variations.

b) In a given lossy dielectric medium, conduction current density Jc = 0.02 sin 10^9 t (A/m^2). Find the displacement current density, if $\sigma = 10^3$ S/m and $\varepsilon_r = 6.5$　　[5+5]

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