Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B. Tech. / M. Tech. / Ph.D.

Branch	:	**Electrical & Electronics Engg.**	**Semester**	:	**3rd**
Title of the Course	:	**Electric & Magnetic Fields.**	**Course Code**	:	**EE203**

Time: 3 Hours **Maximum Marks: 50**

Note : 1. Do not write anything on the question paper except Roll number

2. Assume any data suitably if found missing

Section A: Answer all 10 multiple choice questions. Each question carries 01 mark. [10×1=10]

A1. The unit of Electric field intensity E is given as E

(a) V/m (b) $V-m$ (c) C/m (d) $C-m$

A2. The electric flux density D is related to electric field intensity E by an expression

(a) $D=E/\varepsilon$ (b) $D=\varepsilon E$ (c) $D=\sigma E$ (d) $D=\rho E$

A3. Poisson's equation is given as

(a) $\Delta^2 V=0$ (b) $\Delta^2 V=-\rho_v$ (c) $\Delta^2 V=-\rho_v/\varepsilon$ (d) $\Delta^2 V=-\sigma$

A4. A positively-charged particle placed in an electric field experiences

(a) Displacement (b) Torque (c) Acceleration (d) Force

A5. In which material type normally polarization is observable ?

(a) semiconductor (b) dielectric (c) conductors (d) liquid conductors

A6. A conductor to be equipotential surface, the field inside is

(a) zero (b) unity (c) maximum (d) exponentially varying

A7. The statement that an induced voltage acts to produce an opposing flux is known as

(a) Lenz's law (b) Gauss's law (c) Biot-Savart law (d) Faraday's law

A8. The emf produced by a changing field within a stationary circuit is called as

(a) Induced emf (b) transformer emf (c) mmf (d) vector emf

A9. The concept of displacement current density was introduced by

(a) Maxwell (b) Faraday (c) Ampere (d) Roland

P.T.O

A10. $\Delta.B = 0$ has a significance as

(a) isolated monopole

(b) no isolated monopole

(c) constant current

(d) constant magnetic field intensity

Section B: Answer any 4 questions. Each question carries 5 marks. **[4×5=20]**

B1. If F is a vector, given as $F = 5xy\hat{a}_x + 2xyz\hat{a}_y + 3x^2y^2z^2\hat{a}_z$, then find the divergence of F at point $(1,2,3)$.

B2. State and prove the uniqueness theorem.

B3. Derive and Explain Poisson's and Laplace's equations

B4. State and prove stokes theorem

B5. Find the force between two straight, infinite, parallel wires carrying current I_1 and I_2 separated by a distance d and placed in air.

Section C: Answer any 2 questions. Each question carries 10 marks. **[2×10=20]**

C1. Derive the Maxwell's equations for time varying fields. What will be the Maxwell's equations if both $\bar{B}$ and $\bar{D}$ are constant?

C2. Derive the equation for magnetic field due to infinitely long co-axial transmission line using Ampere's circuital law.

C3. A point charge $Q_1 = 100\,\mu C$ located at a point $(1,1,3)$ experiences a force $F = (3\hat{a}_x + 3\hat{a}_y + 3\hat{a}_z)\,N$ due to a point charge Q_2 at $(2,2,4)$. Determine Q_2.