Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B. Tech.

Branch : **Electrical & Electronics Engg.** **Semester** : **3rd**

Title of the Course : **Electromagnetic Field Theory** **Course Code** : **EEL 203**

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 electric field intensity at any point on the surface of the conductor is entirely

(a) Normal to it (b) Parallel to it (c) oblique incident to it (d) at 45° angle to it

A2. Due to magnetization of a material, the flux density

(a) decreases (b) remains constant (c) increases (d) reduces to zero

A3. An infinite non conducting spherical charge has σ of $10^{-7} C/m^2$. The equipotential surface for a potential of 10V is

(a) 0.88 mm (b) 900 mm (c) 1.32 mm (d) 1.77 mm

A4. An insulated metal sphere of 10 cm radius is charged by rubbing with a charge of $2\times10^{-8} C$. The potential developed is

(a) 1800 V (b) 900 V (c) 2700 V (d) 450 V

A5. Given $\overline{A} = 2\hat{a}_x + 4\hat{a}_y - 3\hat{a}_z$ and $\overline{B} = \hat{a}_x - \hat{a}_y - \hat{a}_z$, then $\overline{A} \cdot \overline{B}$ will be

(a) -2 (b) 9 (c) -1 (d) 2

A6. Energy stored in an inductor is proportional to

(a) inductance (b) square root of the current (c) current (d) square root of the inductance

A7. Given $\overline{A} = 2\hat{a}_x + \hat{a}_y$ and $\overline{B} = 2\hat{a}_x + 2\hat{a}_y - 2\hat{a}_z$, the angle between $\overline{A}$ and $\overline{B}$ will be

(a) 45.13° (b) 40.88° (c) 43.21° (d) 42.33°

A8. Line integral can be transformed into a surface integral by using

(a) Divergence theorem (b) Gauss theorem (c) Stokes theorem (d) none

A9. If $\overline{E}$ is the electric field intensity, $\Lambda(\Lambda \times \overline{E})$ is equal to

(a) $\overline{E}$ (b) $|\overline{E}|$ (c) Null vector (d) Zero

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A10. A $3\mu F$ capacitor is charged by a constant current of $2\mu A$ for 6 seconds. The voltage across the capacitor at the end of charging will be

(a) 3 V (b) 4 V (c) 6 V (d) 9 V

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

B1. Derive the equation for resistance of conducting material.

B2. Determine the capacitance of parallel plate capacitor. The plates are located at $x=0$ and $x=d$ and having a surface area of S. The value of $V=0$ at $x=0$ and $V=V_0$ at $x=d$.

B3. Derive the equation for inductance of co-axial line with solid inner conductor.

B4. State and prove the uniqueness theorem.

B5. State and prove stokes theorem

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

C1. Derive the faraday's laws of electromagnetic induction.

C2. Derive the electric and magnetic boundary conditions for time varying fields. Compare the results with the static boundary conditions.

C3. Derive the equation for $\bar{H}$ due to infinitely long coaxial transmission line using Ampere's circuital law.