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**Presidency University**

**Bengaluru**

**SCHOOL OF ENGINEERING**

**Make-Up Examinations, July 2024**

**Course Code**: ECE3004

**Course Name**: Electromagnetic Theory

**Program:** B.Tech

**Date**: 22/07/2024

**Time**: 09:30 AM – 12:30 PM

**Max Marks**: 100

**Weightage**: 50%

**Instructions:**

1. *Read the all questions carefully and answer accordingly.*
2. *Do not write any matter on the question paper other than roll number.*

**Part A [Memory Recall Questions]**

**Answer all the Questions. Match the following columns (20Qx 2M= 40M)**

|  |  |
| --- | --- |
| **Column A** | **Column B** |
| 1. Laplace equation (C.O.No. 1) [Knowledge] |  |
| 1. Gauss’s law of magnetostatics (C.O. 2) [Comprehension] | 1. H/m |
| 1. Gauss’s law of electrostatics (C.O 2) [ Comprehension ] |  |
| 1. Magnetic permeability (C.O. 2) [ Comprehension] | 1. No magnetic monopole |
| 1. Electric flux density (C.O. 1) [Knowledge] |  |
| 1. Volume of a cuboid with sides , and (C.O.1) [Knowledge] | 1. Law of conservation of charge |
| 1. Gradient of a curl of a vector (C.O.2) [Comprehension] |  |
| 1. Gaussian surface for a charged infinite sheet (C.O.2) [Comprehension] |  |
| 1. Equation of continuity (C.O.1) [Knowledge] |  |
| 1. Static magnetic field (C.O.3) [Application] | 1. F/m |
| 1. Dielectric-dielectric boundary (C.O.3) [Application] | 1. Null (zero) |
| 1. Ampere’s circuital law (C.O.2) [Comprehension] | 1. Sphere |
| 1. Faraday’s law of EM induction (C.O.3) [Application] | 1. Cuboid |
| 1. “*BAC-CAB*” rule (C.O.2) [Comprehension] |  |
| 1. Conductor-dielectric boundary (C.O.3) [Application] | 1. Induced emf |
| 1. Perfect conductors (C.O.2) [Comprehension] | 1. Spherical coordinate system |
| 1. Perfect dielectrics (C.O.2) [Comprehension] |  |
| 1. Gaussian surface for a point charge (C.O. 1) [Knowledge] | 1. Tangential component of E-field is 0 |
| 1. SI unit of (C.O.No. 1) [Knowledge] |  |
| 1. (C.O.No. 1) [Knowledge] | 1. Vector triple product |

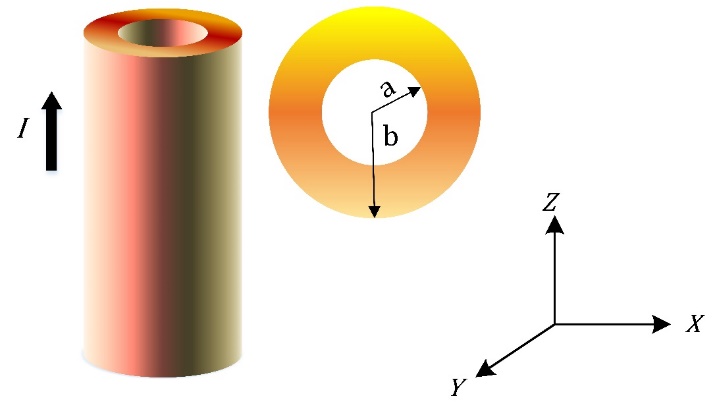
**Part B [Thought Provoking Questions]**

**Answer all the Questions. Each question carries 15 marks. (3Qx15M=45M)**

1. The Poisson’s and the Laplace’s equation are two of the most important equations used for finding electric field distributions from a given charge distribution. Answer the following questions based on these two equations
2. Write down the expression for Poisson’s and Laplace’s equation
3. Does the potential given by satisfy the Laplace’s equation?
4. If satisfy the Laplace’s equation, what is the relationship between and ?

(C.O. 2) [Comprehension]

22. Consider a hollow cylinder of inner radius a and an outer radius b as shown in the figure below. The cylinder is placed along the Z-axis lengthwise and carries a current . Using Ampere’s circuital law, find the magnetic field intensity in the following regions (i) (C.O. 2) [Comprehension]



1. In a certain region of free-space, the electric potential is found to be a function of only and is given by for . Find:
2. and as functions of
3. (ii) Find if the free-space is replaced by a medium having (C.O. 3) [Application]

**Part C [Problem Solving Questions]**

**Answer all the Questions. Each question carries 15 marks. (1Qx15M=15M)**

1. Three point-charges , and are located at three points in vacuum such that the coordinates of the points are , and . With the aid of proper equations, deduce that the electric field intensity at a point where is given by . (C.O. 3) [Application]