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**Presidency University**

**Bengaluru**

 **SCHOOL OF ENGINEERING**

**Makeup examination, July 2024**

**Date**: 11/07/2024

**Time**: 00:00am – 00:00pm

**Max Marks**: 100

**Weightage**: 50%

**Semester:**

**Course Code**: ECE3004 (2020 batch)

**Course Name**: Electromagnetic theory

**Department:** Electronics and communication engineering

 **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**

**Answer any FOUR Questions. Each question carries 15 marks. (4Qx 15M= 60M)**

1. If the three vectors are $\vec{A}=(1, 2, 3)$, $\vec{B}=(3, 2, 1)$ and $\vec{C}=(1, 3, 2)$. Find $\vec{A}×(\vec{B}×\vec{C})$ and verify your answer using bac-cab rule? (CO4, Application)
2. If a vector $\vec{r}$ is given as $\vec{r}=x\hat{i}+y\hat{j}+z\hat{k}$, $\left|\vec{r} \right|=r$ and $f\left(r\right)$ is a scalar function of $r$, then show that the vectors $∇f\left(r\right)$ and $\vec{r}$ are parallel to each other. (CO4, Application)
3. Write down the four Maxwell's equations in the differential and integral form. Then elaborate the physical significance of each of these forms in details. (CO1, Knowledge)

1. Suppose the potential function $V$ is given by $V=xyz$ (in V. Find the electric field vector at a point $P\left(1,2,3\right)$. (CO2, Comprehension)
2. Suppose the magnetic flux density is given by $\vec{B}=-20x\hat{i}+βy\hat{j}+20\hat{k}$ where $β$ is an unknown constant. Using Gauss's law of magnetostatics, evaluate $β$. (CO1, Knowledge)
3. Using the Gauss's law of electrostatics, find the electric field at a distance $r$ from a charged sheet of infinite length and breadth having a uniform charge density of $ρ\_{s}$ in free-space. (CO2, Comprehension)

**PART B**

**Answer any TWO Questions. Each question carries 20 marks. (2Qx 20M= 40M)**

1. A positive point charge $Q$ is situated at point P1 $\left(0,\frac{d}{2}\right)$ and a negative charge $-Q$ at point P2 $\left(0,-\frac{d}{2}\right)$ of the rectangular coordinate system. Determine the resultant E-field strength at any point on the $xy-$plane. (CO2, Comprehension)
2. For a region in free-space having an electric field given by $\vec{E}=x^{2}\hat{i}+y^{2}\hat{j}+z^{2}\hat{k}$ (in V/m), determine the electric flux-density and charge-density at a point $P\left(1,1,1\right)$ using Gauss's law in differential form.    (CO4, Application)
3. A cube of side 2 m is centred at the origin with its edges parallel to the coordinate axes. If the flux density $\vec{D}=\frac{10x^{3}}{3}\hat{i}$, evaluate the total charge contained in the cube. (CO1, Knowledge)