

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2021****Subject Code:3140912****Date:04/09/2021****Subject Name:Electromagnetic Fields****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

	Marks
Q.1 (a) If $\vec{A} = \vec{a}_x + \vec{a}_y - \vec{a}_z$ and $\vec{B} = \vec{a}_x - \vec{a}_y + \vec{a}_z$, Find dot product and Cross product of two vector.	03
(b) State and explain Coulomb's law Vector form.	04
(c) Explain Cylindrical coordinate system in brief. Also write the equations of unit vectors, differential length, differential surfaces and differential volume elements.	07
Q.2 (a) If Cartesian coordinates are $X=1, Y=1, Z=\sqrt{2}$ Convert in to Cylindrical and Spherical Co-ordinates.	03
(b) Explain Electrical field as the Gradient of the electrical potential.	04
(c) Derive the expression for electric field due to infinite surface charge distribution in free space.	07
OR	
(c) Obtain equation for flux density due to infinite line charge using Gauss's law	07
Q.3 (a) Verify that the potential field given below satisfies the Laplace's equation. $V=2x^2-3y^2+z^2$	03
(b) Explain concept of absolute potential. Derive equation of it.	04
(c) Derive Poisson's and Laplace's equations. State and Explain Uniqueness Theorem.	07
OR	
Q.3 (a) Explain Procedure for solving Laplace's equations.	03
(b) Derive Relationship between Electric field intensity and Electric Flux density.	04
(c) With suitable example, Explain Capacitance calculation using Laplace's Equation.	07
Q.4 (a) Calculate the inductance of a solenoid of 200 turns wound tightly on a cylindrical tube of 6 cm diameter. The length of the tube is 60 cm and the solenoid is in air.	03
(b) With the help of an example prove that the value of scalar magnetic potential can be non-unique	04
(c) State and Explain Stoke's theorem. State and Explain Ampere's circuital Law.	07
OR	
Q.4 (a) Explain scalar and vector magnetic potentials.	03
(b) Explain Application of Ampere's circuital law as \vec{H} due to a Co-axial cable.	04
(c) Explain force between two differential current elements.	07

- Q.5** (a) Define divergence and its physical significance. **03**
(b) State and explain Biot-Savart's law **04**
(c) State Maxwell's equation in point form and integral form for static electromagnetic field. **07**

OR

- Q.5** (a) Explain physical Significance of Curl related to types of field **03**
(b) Using Biot-savart's law, find due to infinitely long straight conductor carrying current of I amp. **04**
(c) Explain the terms conduction current density and displacement current density. Find the displacement current density within a parallel plate capacitor where $\epsilon = 10 \epsilon_0$,
 $A = 0.01\text{m}^2$, $d = 0.05 \text{ mm}$ and the capacitor voltage is $200 \sin (200t)$ volts. **07**
