Code No: R1621024 **R16** SET - 1

II B. Tech I Semester Supplementary Examinations, July - 2022
ELECTROMAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

PART –A

1. a) State and explain coulomb's law. (3M)
   b) List the differences between conduction and convection currents. (2M)
   c) Write the Maxwell's second equation? Also mention its significance. (2M)
   d) Write the expression for Lorentz force equation and write its significance. (2M)
   e) Define self and mutual inductance. (2M)
   f) What is displacement current? Explain its significance. (3M)

PART -B

2. a) Derive an expression for the electric field intensity due to an infinite sheet of charge in the x-y plane with a uniform charge density ρ_S. (7M)
   b) Four 10 nC positive charges are located in the z=0 plane at the corners of a square 8 cm on a side. A fifth 10 nC positive charge is located at a point 8 cm distance from the other charges. Calculate the magnitude of the total force on this fifth charge for $\varepsilon=\varepsilon_0$. (7M)

3. a) Explain polarization in dielectrics. (7M)
   b) Define electric dipole? Find electric field intensity at a point (r, θ, ϕ), where r >>d, due to two pint charges Q&–Q are located at (0, d/2,0) and (0,-d/2,0). (7M)

4. a) Derive the Maxwell's third equation. (7M)
   b) A square conducting loop of side 2a lies in the z=0 plane and carries a current I in the counterclockwise direction. Find the H at the center of the loop. (7M)

5. a) A rectangular loop carrying current I_2 is placed parallel to an infinitely long filamentary wire carrying current I_1as shown below. Show that the force experienced by the loop is given by $F = -\frac{\mu_0 I_1 I_2 b}{2\pi}[\frac{1}{\rho_0} - \frac{1}{\rho_0 + a}]\ a_\rho N$ (7M)
   b) Derive the expression for torque on a current loop placed in a magnetic field. (7M)

6. a) Derive an expression for mutual inductance use Newman's formulae. (7M)
   b) Current in a coil is increased from zero to 15 amps at a uniform rate in 6 seconds. It is found that this coil develops self-induced emf of 150 volts whereas an emf of 25 volt is produced in a neighboring coil. Compute self-inductance of the first coil and the mutual inductance between the two coils. (7M)

7. a) Write down the Maxwell's equations for time-varying fields and explain. (7M)
   b) State and explain Poynting Theorem. (7M)
~~~~~~