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

II B. Tech I Semester Supplementary Examinations, Feb/March - 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**

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PART –A

1. a) What do you mean by Gaussian surface? (2M)
   b) Distinguish between conductors and insulators. (3M)
   c) States the Ampere's circuital law. (2M)
   d) What is meant by magnetic dipole? (2M)
   e) What is solenoid? (3M)
   f) State Poynting Theorem. (2M)

PART -B

2. a) Explain the concept of electric field and write down expression for the electric field due to a point charge. (7M)
   b) Calculate electric field E at a point P (3, -4, 2) in free space due to (i) a charge $Q_1 = 4\mu C$ at A (0, 0, 0) (ii) a charge $Q_2 = 2\mu C$ at B (-1, 2, 4) and (iii) both the charges of part (i) and (ii) presents. (7M)

3. a) Derive the expression for electric potential due to a dipole. (7M)
   b) A capacitor consists of two metal plates each $100cm^2$, placed parallel and 2mm apart. The whole of space between the plates is filled with a dielectric having a relative permittivity of 3.5. A P.D of 500V is maintained between the plates. Determine (i) the capacitance, (ii) The charge on the capacitor, (iii) The electric flux density and (iv) the potential gradient. (7M)

4. a) Derive the expression for field intensity due to infinity long straight conductor using Biot-Savart's law. (7M)
   b) Find an expression for the magnetic induction at center of a circular loop. (7M)

5. Explain the force on a differential current element and derive necessary expression. (14M)

6. a) Derive the expression for Inductance of toroid. (5M)
   b) Find the mutual inductance between a conductor and current carrying loop of sides a and b when the nearest side is at a distance 'd' from the wire. Hence deduce the torque acting on the rectangular if the angle between the two plates is θ'. (9M)
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7. a) State and explain the Faraday's laws of electromagnetic induction. (7M)

   b) Describe the statically and dynamically induced EMFs with necessary expressions. (7M)