R17 Regulation *Subject code:* 1P3BB

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech II Year I Semester Supplementary Examinations, February 2021

Electromagnetic Fields

(Electrical and Electronics Engineering)

Maximum Marks: 70 Date: 22.02.2021 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks **(10x2M=20 Marks)**

1 State and explain Gauss's Law.
2 What are the inferences drawn from Laplace's and Poisson's Equations.
3 Distinguish between Conductors and Dielectrics.
4 Define Convection and Conduction Current Densities.
5 Define Magnetic field Intensity.
6 Write the applications of Ampere's Circuital law.
7 Write the expression of Lorentz Force Equation with explanation of terminology.
8 Explain the significance of Coefficient of Coupling.
9 The flux through each turn of a 200 turn coil is (t^3-2t) mWb, where t is in seconds. Find induced emf at t=2s.
10 Explain what do you mean by dynamically induced emf.

Part-B

Answer All the following questions. **(10M X 5=50Marks)**

11 A. Derive the expression for the Electric Field Intensity due to line Charge. (5+5M)
B. Four concentrated charges $Q_1 = 0.3\ \mu C$, $Q_2 = 0.2\ \mu C$, $Q_3 = -0.3\ \mu C$, $Q_4 = 0.2\ \mu C$ are located at the vertices of a plane rectangle. The length of rectangle is 5 cm and breadth of the rectangle is 2 cm. Find the magnitude and direction of resultant force on Q_1.

OR

12 A. State and explain Coulomb's law in electrostatics. (5+5M)
B. Calculate the force of interaction between two charges of values 4×10^{-8} C and 6×10^{-5} C and spaced 10 cm apart in a vacuum. What is the force of interaction, if the medium is kerosene having $\varepsilon_r=2$.

13 A. What is an electric dipole? Obtain expression for torque experienced by an electric dipole in a uniform electric field. (5+5M)
B. Derive the expression for energy stored and energy density in static electric field.

OR

14 A. Derive an expression for capacitance of co-axial cable.(5+5M)
B. State and explain Ohm`s law in point form.

15 A. Using BiotSavart's Law, find H at any point on the axis of a circular current carrying coil.(5+5M)

B. State and prove Ampere's Circuital Law.

OR

16 A.A circular loop of wire of radius 'a', lying in xy plane with its center at the origin carries a current I in the +ϕ direction. Using Biot-Savart's law, find **H**(0,0,z) and **H**(0,0,0).

B. Derive Maxwell's Third Equation.(5+5M)

17 A. Derive an expression for the torque on a current loop placed in a magnetic field.

B. Differentiate between Scalar and Vector magnetic Potential.(5+5M)

OR

18 A. What is Magnetic moment? Describe how a differential current loop behaves like a Magnetic dipole.

B. Derive the Neumann's formulae.(5+5M)

19 A. State and explain Faraday's Law of Electromagnetic Induction.

B. Derive Maxwell's equations in Integral form for Time Varying Fields.(5+5M)

OR

20 A. Derive the expression for one of the Maxwell's equation $(\vec{\nabla} \times \vec{E}) = -\frac{\partial \vec{B}}{\partial t}$

B. Briefly explain the Concept of Displacement current and obtain the expression for the Displacement current density. (5+5M)