R18 Regulation *Subject code:2P3BE*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Supplementary Examinations, March/April 2023

ELECTROMAGNETIC FIELDS

(Electrical and Electronics Engineering)

Maximum Marks: 70 Date:10.04.2023 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 which carries 10M.
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 What does pointing vector signify.
2 List the properties of vector magnetic potential.
3 State Coulomb's law.
4 Derive the expression for energy density in a static electric field.
5 State Biot-Savart's Law.
6 Define magnetic field intensity, magnetic flux density.
7 Define magnetic dipole-moment.
8 Differentiate between conductors and insulators.
9 What is Displacement current?
10 List Maxwell's equations for time varying fields.

Part-B

Answer All the following questions. (5X10M=50Marks)

11 Discuss about behavior of conductors in an electric field. [10M]

OR

12 A. If $V=2x2y+20z-(4/(x^2+y^2))$ Volts, Find E and D at P (6,-2.5,3). [5M]
B. The field $B=(-2a_x+3a_y+4a_z)$ mT is present in free space. Find the vector force exerted on a straight wire carrying 12A in α_{AB} direction given A(1,1,1) and B(2,1,1). [5M]

13 A. What is an electric dipole? Obtain expression for torque experienced by an electric dipole in a uniform electric field. [5M]
B. A charge of 6nc is distributed uniformly along a line of length 6m.Find the field intensity at a radial distance of 2m from the centre of the line. The medium is air for which $\epsilon_r=1$. [5M]

OR

14 A) Derive the boundary conditions for a dielectric interface. [5M]
B) A dielectric sphere of $\varepsilon_r = 5.7$ and of radius 10 cm has a point charge 2 μC placed at its centre. Calculate the surface density of polarization charge on the surface of the sphere. [5M]

15 A) Derive Ohm's law in point form. [5M]

B) A line charge density is uniformly distributed over a length of a '2a'with centre as origin along X-axis. Find E at point 'p' which is on the z-axis at a distance 'd'. [5M]

OR

16 A) State and Explain point form of Ampere's circuit law. [5M]

B) Calculate the magnetic flux density due to a coil of 100 A and area $50cm^2$.

i) On the axis of a coil at a distance of 10m from centre and

ii) At a point 10m in a direction at right angles to the axis. [5M]

17 A) Derive an expression for the torque on a current loop placed in a uniform magnetic field and hence define magnetic dipole-moment from this derivation. [6M]

B) A small current loop L1with magnetic moment 5 az A/m2 is located at the origin while another small loop of current L2 with magnetic moment 3 ay A/m2 is located at (4,-3,10). Determine the torque on L2. [4M]

OR

18 A) Derive the expressions for the self inductances of a solenoid and a toroid. [6M]

B) Two parallel current carrying conductors separated by a distance of 4m carries current of 10 A and 15 A in opposite directions. Find the force on each conductor. Find the field intensity at mid-point between the two conductors. [4M]

19 A) Discuss and derive in detail about the modified form of Maxwell's equation. [6M]

B) State and Explain Faraday's law of Electromagnetic Induction? [4M]

OR

20 A) Explain Maxwell equations in phasor form. [5M]

B) Explain briefly about displacement current and significance of pointing vector. [5M]