



R18 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

Subject code: 2P3BE

B.Tech III Semester Regular/Supplementary Examinations, February 2021

ELECTROMAGNETIC FIELDS

(Electrical and Electronics Engineering)

Maximum Marks: 70

Date: 26.02.2021 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 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 Two points A(2,2,1) and B(3,-4,2) are given in the Cartesian system. Obtain the vector from A to B and a unit vector directed from A to B.
- 2 Write the relationship between Cartesian and spherical coordinate systems.
- 3 Why Gauss's law cannot be applied to determine the electric field due to finite line charge.
- 4 Define Electric Field Intensity.
- 5 What are the dielectrics? Under what conditions do they differ from conductors?
- 6 Write the applications of Ampere's Circuital law.
- 7 Write the expression for the force exerted on a differential current element and also the expression for force on a straight and long current carrying conductor.
- 8 Infer about the significance of mutual inductance.
- 9 What is meant by the term Displacement Current?
- 10 Why Electromagnetic waves travel slower in Conductors than in Dielectrics.

Part-B

Answer All the following questions.

(10MX 5=50Marks)

- 11 State and briefly explain the following:
 - A. The gradient of a scalar field. 3M
 - B. The Divergence of a vector field. 3M
 - C. The curl of a vector field. 4M

OR

- 12 State and explain:
 - A. Divergence theorem, 5M
 - B. Stokes theorem. 5M
- 13 A. State and prove Gauss's Law as applied to an electric field and determine the field due to an infinite line charge. 5M

B. Find the electric Field at a point (1,-2,1)m, if the potential is $V = 3x^2y + 2yz^2 + 2xyz$.
5M

OR

14 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 $-0.3 \mu\text{C}$ is located at A(25, -30, 15) in cm and a second charge of $0.5 \mu\text{C}$ is at B(-10, 8, 12)cm. Find E at (a) the origin (b) P(15, 20, 50)cm. 5M

15 Derive the Expression for the Boundary Conditions between two perfect dielectrics. 10M

OR

16 Starting from Biot-Savart's law, obtain the expression for the magnetic field **B** due to a steady surface current in free space. 10M

17 A. Derive Lorentz force equation. 5M

B. Explain about types of magnetic materials. 5M

OR

18 A. Determine the inductance of a toroid. 5M

B. A rectangular coil of area 10 cm^2 carrying a current of 50 A lies on plane $2x + 6y - 3z = 7$ such that the magnetic moment of the coil is directed away from the origin. Calculate its magnetic moment. 5M

19 Write and explain:

A. Differential forms of Maxwell's equations. 5M

B. Integral forms of Maxwell's equations. 5M

OR

20 State and prove Poynting theorem. 10M