R18 Regulation . *Subject code:* 2P3BE

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

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 μC is located at A(25, -30, 15) in cm and a second charge of 0.5 μC 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