| O.P.Code:23EE0207 | R23 | H.T.No. | | | | | | | | | |
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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**
(AUTONOMOUS)

**B.Tech.II Year I Semester Regular Examinations February-2025**
**ELECTROMAGNETIC FIELD THEORY**
**(Electrical & Electronics Engineering)**

**Time: 3 Hours** **Max. Marks: 70**

**PART-A**
(Answer all the Questions **10 x 2 = 20** Marks)

| | | | | | |
|---|---|---|---|---|---|
| 1 | a | Define Divergence Theorem. | CO1 | L1 | 2M |
| | b | List the properties of Vectors. | CO1 | L1 | 2M |
| | c | Define dielectric strength. | CO2 | L1 | 2M |
| | d | Describe the expression for energy density in electrostatic field. | CO2 | L1 | 2M |
| | e | Define lorentz force. | CO3 | L1 | 2M |
| | f | Define magnetic field strength. | CO4 | L1 | 2M |
| | g | Distinguish between solenoid and toroid. | CO4 | L1 | 2M |
| | h | Describe the expression for energy stored in a magnetic field. | CO5 | L2 | 2M |
| | i | State Faraday's law of electromagnetic induction. | CO6 | L1 | 2M |
| | j | Define pointing vector. | CO6 | L1 | 2M |

**PART-B**
(Answer all Five Units 5 x 10 = 50 Marks)

**UNIT-I**

| | | | | | |
|---|---|---|---|---|---|
| 2 | | If B= y $a_x$+ (x+z) $a_y$ and a point Q is located at (-2,6,3) express B in cylindrical coordinates. | CO1 | L3 | 10M |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 3 | a | Determine the force between the two charge $Q_1$=4*$10^{-4}$ C at A( 2,3,4 ), $Q_2$=-2*$10^{-4}$C at B(3,0,3) in vacuum. | CO1 | L3 | 5M |
| | b | Find E at ( 0,0,2) m due to charged circular disc in x-y plane with ρS=20 n C/$m^2$ and radius 1m. | CO1 | L3 | 5M |

**UNIT-II**

| | | | | | |
|---|---|---|---|---|---|
| 4 | | Explain the boundary conditions of two perfect dielectrics materials. | CO2 | L4 | 10M |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 5 | a | Find the magnitude of D and P for a dielectric material in which E=0.15 mV/m and χ=4.25. | CO2 | L3 | 5M |
| | b | A parallel plate capacitor has an area of 0.8 $m^2$ separation of 0.1 mm with a dielectric for which $\varepsilon_r$ = 1000 and a field of 106 V/m. Calculate C and V. | CO2 | L3 | 5M |

**UNIT-III**

| | | | | | |
|---|---|---|---|---|---|
| 6 | a | A magnetic field B= 3.5*$10^{-2}$$a_z$ exerts a force on a 0.3 m long conductor along x axis. IF a current of 5 A flows in -$a_x$ direction, determine what force must be applied to hold conductor in position. | CO4 | L3 | 5M |
| | b | In cylindrical coordinates B= (2.0/r) $a_\phi$ tesla. Determine the magnetic flux ϕ crossing the plane surface defined by 0.5<r<2.5 m and 0<z<2m. | CO3 | L3 | 5M |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 7 | | Determine the force per meter length between two long parallel wires A and B separated by distance 5 cm in air and carrying currents of 40 A in the same direction. | CO4 | L3 | 10M |

## UNIT-IV

| | | | | |
|---|---|---|---|---|
| 8 | Derive the expression for self-inductance of solenoid. | CO5 | L4 | 10M |

**OR**

| | | | | |
|---|---|---|---|---|
| 9 | Calculate the inductance of a 10 m length of coaxial cable filled with a material for which $\mu_r = 80$ and radii inner and outer conductors are 1 mm and 4 mm respectively. | CO5 | L3 | 10M |

## UNIT-V

| | | | | |
|---|---|---|---|---|
| 10 | Write Maxwell's equation in good conductors for time varying fields and static fields both in differential and integral form. | CO6 | L4 | 10M |

**OR**

| | | | | |
|---|---|---|---|---|
| 11 | Explain faradays law of electromagnetic induction and there from derive maxwell's equation in differential and integral form. | CO6 | L4 | 10M |

***** END *****