**18EE401**

**Hall Ticket Number:**

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| **IV/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
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| **July 2021** | **Electrical & Electronics Engineering** | | |
| **Fourth Semester** | **Electromagnetic Fields** | | |
| **Time:** Three Hours | | **Maximum:** 50 Marks | |
| ***Answer question 1 compulsory.*** | | | **(10X1 = 10Marks)** |
| ***Answer one question from each unit.*** | | | **(4X10=40Marks)** |

|  |  |  | CO | BL | M |
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| 1 | a) | State the limitations of Coulomb’s law. | CO1 | L1 | 1M |
|  | b) | Mention the units for the following quantities: Electric field intensity, and Electric flux density and Volume charge density? | CO1 | L1 | 1M |
|  | c) | State the relation between the electric current, I and electric current density, **J.** | CO1 | L1 | 1M |
|  | d) | Write the expression for electric field intensity due to electric dipole. | CO2 | L1 | 1M |
|  | e) | Define capacitance. | CO2 | L1 | 1M |
|  | f) | Write the applications of Ampere’s circuital law. | CO2 | L1 | 1M |
|  | g) | Define permeability. | CO3 | L1 | 1M |
|  | h) | If a magnetic field, H = 3**ax** + 2**ay**, A/m exists at a point in free space, what is the magnetic flux density at the point? | CO3 | L1 | 1M |
|  | i) | Define uniform plane wave. | CO4 | L1 | 1M |
|  | j) | Write the significance of Poynting vector. | CO5 | L1 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Define Electric potential and obtain the relation between Electric potential and Electric Field Intensity. | CO1 | L2 | 5M |
|  | b) | A point charge of 60 mC is placed at the centre of a cube. Find the total flux passing through one face of the cube. | CO1 | L3 | 5M |
|  |  | **(OR)** |  |  |  |
| 3 | a) | Show that div ( **D** )=ρv . | CO1 | L2 | 5M |
|  | b) | Obtain the expression for Electric flux density of an infinite line charge placed along y-axis by applying Gauss’s law. | CO1 | L2 | 5M |
| **Unit-II** | | | | | |
| 4 | a) | State the boundary conditions in electrostatic fields and prove any one of them | CO2 | L2 | 5M |
|  | b) | Find the energy stored in a system of four identical point charges, Q = 4 nC at the corners of a square one meter on a side. | CO2 | L3 | 5M |
| **(OR)** | | | | | |
| 5 | a) | Define Electric Dipole , also derive the expression for potential and Electric Field Intensity due to an electric dipole. | CO2 | L2 | 5M |
|  | b) | Three point charges -1nC, 4nC and 3 nC are located at (0,0,0), (0,0,1) and (1,0,0) respectively. Find the energy in the system. | CO2 | L3 | 5M |
| **Unit-III** | | | | | |
| 6 | a) | Derive the expression for magnetic field intensity **(H)** due to infinitely long straight current carrying conductor placed along z-axis by using Biot-Savarts law. | CO3 | L2 | 6M |
|  | b) | Planes z = 0 and z = -5 m carry currents with **K** = -20**ax** A/m and **K** = 30**ax** A/m respectively. Determine **H** at the point (-2,-2,-2) m. | CO3 | L3 | 4M |
| **(OR)** | | | | | |
| 7 | a) | Derive the expression for the force between two finite current carrying loops?. | CO3 | L2 | 5M |
|  | b) | A circular loop located on x2+y2=16, z=0 carries a direct current of 15 A along **aØ**. Determine magnetic field intensity at (0, 0 ,7) and (0,0, -3). | CO3 | L3 | 5M |
| **Unit-IV** | | | | | |
| 8 | a) | Write and explain Maxwell’s equations in integral and point form and also make their word statements for time varying fields. | CO4 | L2 | 5M |
|  | b) | In a material for which σ = 5 S/m and εr = 1.0, the electric field intensity, E is given by E= 250 Sin1010 t V/m. Find the conduction and displacement current densities.? | CO4 | L3 | 5M |
| **(OR)** | | | | | |
| 9 | a) | State the importance of Poynting theorem and prove it | CO5 | L2 | 5M |
|  | b) | If σ=0,Ɛ= 2.5 Ɛo and µ=10 µo, determine whether or not the following pairs of fields satisfy Maxwell’s equations.  (i) ;  (ii) ; | CO5 | L3 | 5M |



**\*\*\* Remove the border lines after typing the QP**