**20EC304**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION** | | | |
| **February, 2023** | **Electronics and Communications Engineering** | | |
| **Third Semester** | **Electromagnetic Field Theory** | | |
| **Time:** Three Hours | **Maximum:** 70 Marks | | |
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| *Answer Question No.1 compulsorily.* | | | (14X1 = 14 Marks) |
| *Answer ONE question from each unit.* | | | (4X14=56 Marks) |

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| 1. | a) | | State Coulombs law. | CO 1,L1 | 1M |
|  | b) | | Define surface charge density & mention the unit. | CO 1,L2 | 1M |
|  | c) | | Define potential gradient. | CO 1,L2 | 1M |
|  | d) | | Write the significance of divergence theorem. | CO 1,L1 | 1M |
|  | e) | | What is the capacitance? | CO 2,L2 | 1M |
|  | f) | | State Laplace equation | CO 2,L3 | 1M |
|  | g) | | What is meant by displacement current? | CO 2,L2 | 1M |
|  | h) | | List the properties of dielectric materials? | CO 3,L1 | 1M |
|  | i) | | State Biot - Savart’s law. | CO 3,L3 | 1M |
|  | j) | | What is Vector Magnetic Potential? | CO 3,L2 | 1M |
|  | k) | | Write Lorentz force equation. | CO 4,L1 | 1M |
|  | l) | | Write important properties of uniform plane wave. | CO 4,L1 | 1M |
|  | m) | | Write an expression for Maxwell’s 4th equation in point form & integral form. | CO 4,L1 | 1M |
|  | n) | | What is meant by skin effect? | CO 4,L1 | 1M |
| **Unit-I** | | | | | |
| 2. | a) | Three point charges Q1=Q2=10-6 C and Q3=0.5 x 10-6 C are located in air at the corners of an equilateral triangle of 0.5 m side. Determine the magnitude and direction of the force on Q3. | | CO1,L2 | 7M |
|  | b) | Derive the mathematical equation for force between two-point charges. | | CO1,L3 | 7M |
| **(OR)** | | | |  | |
| 3. | a) | State and explain Gauss’s law and derive point form of Gauss’s law also calculate due to infinite surface charge distribution. | | CO1,L4 | 7M |
|  | b) | Derive the expression for energy density in electrostatic fields. | | CO1,L2 | 7M |
| **Unit-II** | | | |  | |
| 4. | a) | Derive the boundary conditions for conductor-dielectric interface. | | CO2,L3 | 7M |
|  | b) | Derive the expression for capacitance of a Parallel wire line. | | CO2,L2 | 7M |
| **(OR)** | | | |  | |
| 5. | a) | Obtain an expression for continuity equation of current | | CO 2,L3 | 7M |
|  | b) | Derive the Poisson’s and Laplace’s equations. | | CO 2,L3 | 7M |
| **Unit-III** | | | | | |
| 6. | a) | State and explain Ampere circuit’s law & derive an expression for magnetic field intensity due to infinite line. | | CO3,L3 | 7M |
|  | b) | Explain the concept of scalar & vector magnetic potentials & derive its expressions. | | CO3,L4 | 7M |
| **(OR)** | | | | | |
| 7. | a) | Derive the expression for Toque on planar loop placed in an external magnetic field. | | CO3,L2 | 7M |
|  | b) | Derive the boundary conditions for the magnetic fields between two magnetic materials. | | CO3,L3 | 7M |
| **Unit-IV** | | | |  | |
| 8. | a) | State and explain Maxwell’s Equations for time-varying fields in both differential & integral forms. | | CO4,L2 | 7M |
|  | b) | Explain the wave polarizations. | | CO4,L4 | 7M |
| **(OR)** | | | |  | |
| 9. | a) | Discuss in detail electromagnetic waves in perfect dielectric. | | CO4,L2 | 7M |
|  | b) | Derive the expression of Poynting vector and explain the concept of power flow in electromagnetic fields. | | CO4,L3 | 7M |

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