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**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_\_

**End Semester Examination – Nov/Dec - 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **12EC203** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **ELECTROMAGNETIC FIELDS** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Course outcome** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | | |
| 1. | Name the three co ordinate systems. | CO1,CO2 | (1) |
| 2. | Define curl of a vector. | CO1,CO2 | (1) |
| 3. | Write the significance of the principle of superposition in field theory. | CO1,CO2 | (1) |
| 4. | What is electric flux? | CO1 | (1) |
| 5. | Write the Lorentz force equation for a moving charge. | CO3 | (1) |
| 6. | The unit of magnetic flux density is \_\_\_\_\_\_\_\_\_. | CO2 | (1) |
| 7. | What is electric polarization? | CO3 | (1) |
| 8. | Define mutual inductance. | CO2 | (1) |
| 9. | Write Maxwell’s equation in integral form from Faraday’s law. | CO4 | (1) |
| 10. | What is meant by skin effect in a conductor? | CO5 | (1) |

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| **PART B(5 X 3= 15 MARKS)** | | | |
| 11 | Use spherical coordinates and integrate to find the area of the region 0≤φ≤ 2π and 0≤θ≤ π/2 on the spherical shell of radius a ? | CO1,CO2 | (3) |
| 12 | Find the magnitude of electrostatic field intensity at (-1,1,-3) due to the 25 μC charge at (3,1,0) .. | CO1 | (3) |
| 13 | Explain magnetic vector potential. | CO2 | (3) |
| 14 | Derive an equation for electrostatic energy density. | CO3 | (3) |
| 15 | Explain the concept of displacement current. | CO4 | (3) |

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| **PART C(5 X 15= 75 MARKS)** | | | | | |
| 16. | a. | | Transform the vector F=10ax-8ay+6az to cylindrical coordinates at  (10,-8,6). | CO1,  CO2 | (8) |
| b. | | Given the point C in rectangular coordinate system as C(-3,2,1) and D in spherical coordinate system as D(r=5,θ=200 & Φ=-700). Determine the distance from C to D. | CO1,  CO2 | (7) |
| (OR) | | | | | |
| 17. | a. | | A particular vector field F = r 2 cos2φ a r **+** z sin φ a **φ** is in cylindrical system. Find the flux emanating due to this field from closed surface of the cylinder0≤z≤1, r=4. Verify divergence theorem. | CO1 | 10 |
| b. | | Find divD at origin if D=e-xsin y ax - e-xcos y ay + 2 z az . | CO1 | 5 |
| 18. | a. | | Three point charges q1 = 10- 6 C, q2 = -10 -6 C and q3 = 0.5 x 10 -6 C are located in the corners of an equilateral triangle of 50 cm side. Determine the magnitude and direction of the force on q3. | CO1 | 10 |
| b. | | Calculate the total charge within the volume 0.1≤≤0.2 ; where | CO1 | 5 |
| (OR) | | | | | |
| 19. | a. | State Gauss’s law. Using Gauss’s law derive an equation to find the electric field intensity at any point due to an infinite line charge with charge density ρL. | | CO1 | 8 |
| b. | A 15nC point charge is at origin in free space. Calculate the scalar potential V at the point (-2,3,-1) if V=0 at (6,5,4). | | CO1 | 7 |
| 20. | a. | Derive an expression for the magnetic flux density and field intensity at any point along the axis of a circular coil carrying current I. | | CO2 | 10 |
| b. | A solenoid with radius of 2 cm is wound with 25 turns per cm length and carries 10 mA. Find H at the centre if the total length is 15 cm. | | CO2 | 5 |
| (OR) | | | | | |
| 21. | a. | The field B=-2ax+3ay+4az mT is present in free space.. Find the vector force exerted on a straight wire carrying 12A in the aAB direction, given A(1,1,1) & b(3,5,6). | | CO3 | 8 |
| b. | Using Ampere’s circuital law find  at any point due to infinitely long straight conductor. | | CO2 | 7 |
| 22. | a. | State and explain continuity equation of current. | | CO3 | 7 |
| b. | Describe the boundary relations at the interface between two magnetic media. | | CO2 | 8 |
| (OR) | | | | | |
| 23. | a. | Derive an expression for the capacitance of a coaxial cables. | | CO3 | 8 |
| b. | Derive Poisson’s and Laplace’s equations. | | CO3 | 7 |
| 24. | a. | Define Poynting vector and derive the expression of Poynting theorem in integral form. | | CO5 | 10 |
| b. | Derive the Maxwell’s equation from Faraday’s law in integral and point forms. | | CO4 | 5 |
| (OR) | | | | | |
| 25. |  | Obtain the wave propagation equation in free space and in dielectrics and also its possible solution. | | CO5 | 15 |

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