

**B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019**

Third Semester

EE16302 – ELECTROMAGNETIC THEORY*(Electrical and Electronics Engineering)***(Regulation 2016)****Time: Three Hours****Maximum : 100 Marks**

Answer ALL questions

PART A - (10 X 2 = 20 Marks)

- | | CO | RBT |
|---|----|-----|
| 1. Determine the angle between $A = 2\vec{a}_x + 4\vec{a}_y$ and $B = 6\vec{a}_y - 4\vec{a}_z$ | 1 | AP |
| 2. State Stoke's theorem. | 1 | R |
| 3. The electric potential near the origin of a system of co-ordinates is
$V=5x^2+8y^2+10z^2$. Find the electric field at(1,2,3) | 2 | AP |
| 4. Define dielectric strength. | 2 | R |
| 5. State Biot-savart's law. | 3 | R |
| 6. Classify the magnetic materials. | 3 | U |
| 7. Define self inductance and mutual inductance. | 3 | R |
| 8. Can a magnetic field exist in a good conductor if it is static or time varying? | 3 | U |
| 9. Define propagation constant. | 5 | R |
| 10. Define depth of penetration. | 5 | R |

PART B - (5 X16 = 80 Marks)

11. (a) A particular vector field $\vec{F} = r^2 \cos^2 \phi \vec{a}_r + Z \sin \phi \vec{a}_\phi$ is in (16) 1 AP cylindrical system. Verify the divergence theorem for this field from the closed surface of the cylinder
 $0 \leq z \leq 1$, $r = 4$.

(OR)

- (b) State and Prove Divergence theorem and Stokes theorem (16) 2 AP
12. (a) (i) Obtain the Poisson's equation & Laplace' equation from (8) 2 U Gauss's law and also write the equations in three different co-ordinates.

(ii) If $V = \frac{60 \sin \theta}{r^2}$ volts, Find V and E at (8) 2 U

P (3, 60°, 25°). Where V is the electric potential and E is the electric field intensity.

(OR)

- (b) A line charge density ρ_L is uniformly distributed over infinite length (16) 2 AP with as origin along x axis. Find E at a point P which is on the Z axis at a distance 'd'.
 13. (a) Derive an expression for magnetic field intensity due to circular loop (16) 2 AP carrying current I amps at a point along its axis.

(OR)

- (b) The field winding of DC electromagnet is wound with 800 turns and (16) 3 AP has a resistance of 40Ω when exciting voltage is 230 V and the magnetic flux around the coil is 0.004 Wb. Calculate self-inductance and energy stored in magnetic field.
 14. (a) A ring with a cross sectional area of 3 cm^2 and a mean circumference (16) 3 AP of 15cm is wound with 250 turns of wire carrying a current of 0.3A. The relative permeability of the ring is 1500.
 (i) Calculate the flux established in the ring.
 (ii) If a saw cut of width 2mm is made in the above ring, find the new value of the flux in the circuit.

(OR)

- (b) Derive the set of Maxwell's equations with solutions in integral form (16) 4 U from fundamental laws for free space.
 15. (a) Deduce the wave equations for conducting medium. (16) 5 U

(OR)

- (b) Find the conducting behavior of ground at 1kHZ, 10MHZ and 10 GHZ.
 Given $\epsilon_r = 10$ and $\sigma = 5 \times 10^{-3} \text{ mho/m}$.