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Question Paper Code: 50333

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Third Semester

Electrical and Electronics Engineering

15UEE303 - FIELD THEORY

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. A field line and an equi-potential surface are
 - (a) always parallel
 - (b) always at 90°
 - (c) inclined at any angle 0°
 - (d) none of these
2. Indicate which of the following material does not retain magnetism permanently
 - (a) Soft iron
 - (b) Stainless steel
 - (c) Hardened steel
 - (d) None of these
3. The electric field intensity at a point is situated 4 *meters* from a point charge is 200 *N/C*. If the distance is reduced to 2 *meters*, the field intensity will be
 - (a) 400 *N/C*
 - (b) 600 *N/C*
 - (c) 800 *N/C*
 - (d) 1200 *N/C*
4. Convert point P(2, 1, 3) from Cartesian to cylindrical coordinates
 - (a) 2.0, 20.5⁰,3
 - (b) 2.24, 26.56⁰ 3
 - (c) 2.4, 23.45⁰, 4
 - (d) 1.96, 25⁰,4
5. One of the following is not a source of magneto static fields
 - (a) A direct current in a wire
 - (b) A permanent magnet
 - (c) An accelerated charge
 - (d) An electric field linearly changing with time

6. The electromagnet has 50 turns and a current of 1 A flows through a coil. If the length of the magnetic circuit is 200 mm. What is the magnetic field strength
- (a) 2500 AT/m (b) 250 AT/m (c) 25 AT/m (d) 2.5 AT/m
7. Maxwell's equation from electric Gauss's Law in point form is
- (a) $\nabla \cdot \mathbf{D} = 0$ (b) $\nabla \cdot \mathbf{D} = \rho$ (c) $\nabla \times \mathbf{D} = 0$ (d) $\nabla \times \mathbf{D} = \rho$
8. Static electricity is produced due to
- (a) friction (b) conduction
(c) induction (d) both (a) and (c)
9. What is the major factor for determining whether a medium is free space, lossless dielectric, lossy dielectric or good conductor?
- (a) Attenuation Constant (b) Reflection Coefficient
(c) Loss Tangent (d) Constitutive Parameter (ϵ, μ, σ)
10. The velocity of plane wave in a lossless medium having a relative permittivity of 4 and relative permeability of 1.2 is
- (a) 1.37×10^8 m/s (b) 1.5×10^8 m/s
(c) $1=2.5 \times 10^8$ m/s (d) 2.37×10^8 m/s

PART - B (5 x 2 = 10 Marks)

11. What are the source of electric field and magnetic fields?
12. Define Dielectric Strength.
13. State Biot-Savart's law.
14. Interpret the significance of Displacement current.
15. State Propagation Constant.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Verify, whether the vector field $\mathbf{A} = yz\vec{a}_x + zx\vec{a}_y + xy\vec{a}_z$ is irrotational and solenoid. (8)
- (ii) Mention the various Sources and Effects of electromagnetic effects. (8)

Or

(b) If $\vec{C} = 3y^2\vec{a}_x + 4z\vec{a}_y + 6y\vec{a}_z$ verify Stock's Theorem for the open surface $z^2 + y^2 = 4$ in the $x = 0$ plane. (16)

17. (a) Apply Coulomb's Law to determine the electric field intensity due to infinite line of uniform charged wire. (16)

Or

(b) State and explain the boundary conditions of electric field at dielectric and conductor. (16)

18. (a) Find the magnetic field intensity at any point 'P' on the axis of a circular coil carrying with a loop radius of 'a' meter. (16)

Or

(b) What is Magnetization? Explain the classification of magnetic materials. (16)

19. (a) Derive and Explain Maxwell's equations both in integral and point forms. (16)

Or

(b) Derive the expression for Transformer EMF. (16)

20. (a) Obtain the electromagnetic wave equation for free space in terms of Electric field. (16)

Or

(b) Explain Poynting Vector and Power flow in Electromagnetic fields. (16)
