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Question Paper Code: 53033

B.E. / B.Tech. DEGREE EXAMINATION, NOV 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)

- _____ of two vectors uses the Law of Parallelogram.
(a) multiplication (b) division (c) addition (d) subtraction
- In terms of Spherical coordinate system variables, y of Cartesian coordinate system is given as
(a) $r \sin \theta \cos \phi$ (b) $r \sin \theta \sin \phi$ (c) $r \cos \theta \sin \phi$ (d) $r \cos \theta \cos \phi$
- ϵ_0 is _____ F/m.
(a) 8.854×10^{-12} (b) 6.654×10^{-12} (c) $.854 \times 10^{-10}$ (d) 6.654×10^{-10}
- Electric dipole is a pair of _____ and _____ point charges.
(a) Equal and same (b) Unequal and same
(c) Equal and opposite (d) Unequal and opposite
- Magnetic dipole moment is a product of
(a) Current and area (b) Area and its direction
(c) Current, area and its direction (d) Current and its direction

6. Ampere's Circuital Law is analogous to _____ Law in electrostatics.
 (a) Lenz's (b) Gauss's (c) Biot–Savart's (d) Faraday's
7. Maxwell's equations in _____ form give information at points of discontinuity in electromagnetic fields.
 (a) Differential (b) Integral (c) Algebraic (d) Trigonometric
8. Conduction current through a wire is _____ displacement current in capacitor.
 (a) Same as (b) Different from (c) Twice of (d) Thrice of
9. Wave attenuation is given as
 (a) $e^{+\beta}$ (b) $e^{-\beta x}$ (c) $e^{+\alpha x}$ (d) $e^{-\alpha x}$
10. Reflection coefficient Γ is
 (a) ≥ 100 (b) $= 10$ (c) ≤ 1 (d) Infinity

PART - B (5 x 2 = 10 Marks)

11. Give the relation between Cartesian and cylindrical co-ordinate systems.
12. Two point charges of 0.7 mC and 4.9 μ C are situated in free space at (2, 3, 6) and (0, 0, 0). Calculate the force acting on the 0.7mC charge.
13. Formulate the relation between electric field intensity and electric flux density.
14. Infer that the time varying field is not conservative.
15. Retrieve the velocity equation for electromagnetic wave in free space and in lossless dielectric.

PART - C (5 x 16 = 80 Marks)

16. (a) Compare the both sides of divergence theorem for the field $\vec{D} = \rho^2 \cos^2\phi \ a_\rho + z \sin\phi \ a_\phi$ over the closed surface of the cylinder, $0 < z < 1$, $\rho = 4$. (16)

Or

- (b) (i) Express the point P (1, -4, -3) in cylindrical and spherical co-ordinates. (6)
- (ii) Transform the vector $E = (y^2 - x^2) \ a_x + xyz \ a_y + (x^2 - z^2) \ a_z$ to cylindrical and spherical system. (10)

17. (a) Use Gauss law to calculate electric flux density and electric field intensity due to point charge in the tip of needle, conductor having infinite line charge and piece of semiconductor having surface charge. (16)

Or

- (b) Predict the condition at a boundary between two dielectrics made up of paper and mica sheet in the electric field. (16)

18. (a) Use Biot – Savart's law to find magnetic field intensity for finite length of conductor carrying current at a point P on Y – axis. (16)

Or

- (b) Compute the boundary conditions between two magnetic media. (16)

19. (a) Determine the Maxwell's equation for time varying field in point and integral form using Ampere's law, Faraday's law and Gauss law. (16)

Or

- (b) Determine the displacement current in the dielectric parallel plate capacitor and also the conduction current in the filament. Defend that both the currents are same. (16)

20. (a) (i) Explain how an electromagnetic wave is generated. (4)

- (ii) Derive the electromagnetic wave equations in free space and mention the types of solutions. (12)

Or

- (b) (i) Explain Poynting vector. (4)

- (ii) Derive the power and energy in the electromagnetic wave using Poynting theorem. (12)
