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Dec.-23-0447

EE-505 (Electromagnetic Field Theory)

B.Tech. 5th (CBCS)

Time : 3 Hours Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, selecting one question each from Section A, B, C and D. All parts of Section E are compulsory.

SECTION - A

1. (a) Two point charges - 4 μC and 5 μC are located at (2,–1, 3) and (0, 4, –2), respectively. Find the potential at (1, 0, 1) assuming zero potential at infinity. (5)

   (b) For a vector field A, show explicitly that $\nabla \cdot \nabla \times A = 0$; that is, the divergence of the curl of any vector field is zero. (5)

2. State and proof gauss law and explain two applications of gauss law with proper figure and mathematical expression. (10)

SECTION - B

3. Explain Ampere's circuit law and discuss the application Infinite Line Current with proper figure and derivation. (10)

4. (a) Explain Magnetic Vector Potential. (5)

   (b) Define and explain Biot -Savart's law with proper figure and mathematical expression. (5)

SECTION - C

5. (a) Derive the expression for the attenuation constant, phase constant and intrinsic impedance for a uniform plane wave in a good conductor. (5)

   (b) In a lossless medium for which $\eta = 60\pi$, $\mu_r = 1$, and $H=-0.1\cos(\omega t-z)a_x+0.5\sin(\omega t-z)\,a_y$ A/m, calculate ε_r, ω, and E. (5)

6. Discuss Maxwell's Field equation in static Fields and Time varying fields with their physical Interpretations. (10)

SECTION - D

7. (a) Explain the Poynting vector Theorem and its significance. (7)

   (b) Explain characteristic impedance of a transmission line. (3)

8. Derive the expression for Input Impedance and SWR of a transmission line. (10)

SECTION - E (Compulsory)

9. (a) Define Faraday induction Law.

   (b) What is the divergence of curl of a vector?

   (c) Define Coulomb's law

   (d) What is meant by displacement density?

   (e) Define the terms Reflection and Refraction.

   (f) Write the Maxwell's equations for free space in point form.

   (g) Define characteristic impedance.

   (h) Define voltage reflection coefficient.

   (i) Define Smith chart.

   (j) Define standing waves. (10×2=20)