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Dec.-22-0210

EC-502 (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 from each section A, B, C and D. Question no. 9 is compulsory.

SECTION - A

1. Express the vector field $\vec{A} = xy^2z\vec{a}_x + x^2yz\vec{a}_y + xyz^2\vec{a}_z$ in cylindrical and spherical coordinates at (3, -4, 5). (10)
2. What is Stokes Theorem? What are its advantages and Limitations? Can Stoke's Theorem be applied to closed surfaces? (10)

SECTION - B

3. Explain Biot-Savart's Law and show that the magnetic field intensity due to an infinitely long filamentary current I along the z-axis in cylindrical coordinates, is inversely proportional to the radial distance to the field point. (10)
4. Find the electric flux density and volume charge density if the electric field, $E = x^2\vec{a}_x + 2y^2\vec{a}_y + z^2\vec{a}_z$ V/m in a medium whose $\epsilon_r = 2$. (10)

SECTION - C

5. Derive Poynting Theorem and give interpretation of each term. (10)

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6. Derive general expression for reflection coefficient and transmission coefficient for E and H fields when a Electromagnetic wave is incident normally on the boundary separating two different perfectly dielectric medium. (10)

SECTION - D

7. A transmission line is lossless and is 25m long. It is terminated in a load of $Z_L = 40 + j 30\Omega$ at a frequency of 10MHz. The inductance and capacitance of the line are $L = 300\text{nH/m}$ and $C = 40 \text{ pF/m}$. Find the input impedance at the source and at the mid-point of the line. (10)
8. Write a short note on Smith chart along with its applications. (10)

SECTION - E (Compulsory Question)

9. Answer the following:
 - (a) Write a short note on physical interpretation of gradient.
 - (b) State Guass's Law in differential and Integral form.
 - (c) Write the wave equations in a conductive medium.
 - (d) Explain Brewster angle.
 - (e) What is distortion less transmission line?
 - (f) Explain Reflection coefficient.
 - (g) What is Quarter wave transformer?
 - (h) Explain depth of penetration.
 - (i) State Faraday's Law.
 - (j) What is the intrinsic impedance of a medium? (10×2=20)