J-21-0045

B. Tech. EXAMINATION, 2021

Semester V (CBCS)

ELECTROMAGNETIC FIELD THEORY

EC-502

Time : 2 *Hours*   *Maximum Marks* : 60

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from any of the Sections A, B, C and D. Q. No. **9** is compulsory.

Section A

1. (a) Show that the vector A is solenoidal and irrotational both, given that :   **7½**

    $$\vec{A} = yza_x + zxa_y + xya_z$$

    (b) Find the location of point (2, −1, 3) in cylindrical and spherical coordinate system.   **7½**

2. (a) State and prove "Divergence Theorem". **7½**

(b) Find out the boundary conditions of electric field vector E and D over two dielectric media of different permittivity. **7½**

Section B

3. State and prove Ampere's circuital law or Ampere's work law. **15**

4. Write all the Maxwell equation in differential and integral form and explain their physical significance. **15**

Section C

5. Derive the electromagnetic wave equation in free space. **15**

6. State and prove Poynting theorem and explain its physical significance. **15**

Section D

7. What do you mean by Transmission Line ? Draw an electrical equivalent circuit for two wire transmission line. Prove basic transmission line equation. **15**

8. Define characteristics impedance of a transmission line. Derive expression for the characteristic impedance, attenuation and phase constants of a transmission line in terms of R, L G and C of the line. **15**

(Compulsory Question)

9. Attempt any *Six* questions :

(i) Explain the Physical interpretation of Divergence and Curl of a vector field.

(ii) Prove that Curl of any vector field has no divergence i.e. Div.Curl E = 0.

(iii) Explain Maxwell's equations and their physical significance.

(iv) Deduce the relation between reflection coefficient and SWR.

(v) What is analogy between electric field and magnetic field ?

(vi) Explain VSWR and reflection coefficient.

(vii) Explain Poisson's and Laplace equation.

(viii) What is Continuity Equation ? **6×2½=15**