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17229(N)

**B. Tech 5th Semester Examination**  
**Electromagnetic Field Theory (CBS)**  
**EE-505**

Time : 3 Hours [www.zoomy.in](http://www.zoomy.in) 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 from each of the Section A, B, C and D. Section E is compulsory.

**SECTION - A**

1. (a) By using Gauss's law establish the relation for the capacitor per unit length between two infinitely long centric conducting cylinders. (10)
- (b) Explain curl of a vector field and stoke theorem. (10)
2. (a) Use spherical coordinates to find the volume of a hemispherical shell of inner radius 2.00 m and outer radius 2.02 m. (12)
- (b) State and explain laplace equation. (8)

**SECTION - B**

3. (a) Define and explain amperes circuital law in differential and integral form. (10)
- (b) State and explain the expression for energy stored in magnetic field. (10)

4. Determine the current density at respective point for magnetic field given below:
- (a)  $H = y \sin x a_x + (x + e^x) a_z$  at origin.
- (b)  $H = 3 \rho \cos \phi a_\phi$ , A/m<sup>2</sup> at (3,  $\pi$ , 0) in cylindrical system.
- (c)  $H = 10 \cos a_\theta$  at (5,  $\pi/3$ , 0) in spherical system. (20)

### SECTION - C

5. (a) Derive the wave propagation equation in dielectric medium. Find out the propagation constant, attenuation constant and phase shift constant also. (10)
- (b) Derive the relation between E and H in uniform plane wave. (10)
6. (a) Magnetic field intensity H of an electromagnetic wave is given by  $H = 0.2 \cos(\omega t - 10x) a_z$  A/m.
- In free space find electric field E and current density  $J_d$ . (10)
- (b) Explain the propagation of electromagnetic wave in lossy dielectrics. (10)

### SECTION - D

7. A 300 m long transmission line has the following constant  $R=4.5$  k $\Omega$ ,  $L=0.15$  mH,  $G=60$  mho,  $C=12$  nF. The line operates at a frequency of 6 MHz and is terminated by a  $30 + j60$  ohm load. Calculate: (i) the propagation constant, (ii) velocity of wave transmission, (iii) the reflection coefficient, (iv) the standing wave ratio. (20)

8. (a) Explain the reflection of plane wave at normal incidence for a perfect dielectric. (10)
- (b) Explain the role of smith chart in measurement of various parameters in transmission line. (10)

### SECTION - E

9. (a) What is Curl of a vector?
- (b) Define equipotential surface.
- (c) Define characteristic impedance of a transmission line.
- (d) Define Guass's law.
- (e) Define continuity equation in electric field
- (f) Explain the homogenous medium with suitable example.
- (g) Write the Maxwell equation, in differential form.
- (h) Write the equation of Standing Wave Ratio (SWR).
- (i) Explain the Helmholtz's equation for electromagnetic wave propagation.
- (j) Derive the conditions of lossless transmission line. (10×2=20)