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Total No. of Questions : 09] May-08 [Total No. of Pages :02

# Paper ID [EC208]

(Please fill this Paper ID in OMR Sheet)

**B.Tech. (Sem. - 4th)**

**ELECTROMAGNETIC FIELD THEORY (EC - 208)**

**Time : 03 Hours** **Maximum Marks : 60**

**Instruction to Candidates:**

1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

MAY 2008

## Section - A

*Q1)* *(10 × 2 = 20)*

a) What is inconsistency in the Ampere's law?

b) Write an expression of the capacitance and inductance for parallel plate transmission line.

c) Write down the time varying Maxwell's equations in both differential and integral form.

d) Write down the equation for propagation constant for transmission line in terms of transmission line parameters.

e) A vector A is drawn from the point (0, -1, -3) to (5, 1, -5). Find a unit vector in the direction of A.

f) Write an expression of the cutoff frequency for dominant TE mode propagating in rectangular waveguide.

g) What is the continuity equation?

h) Find the div D at the origin if $D = e^{-x} \sin y a_x - e^{-x} \cos y a_y + 2z a_z$.

i) Define the Gauss law of magnetostatics with mathematical representation.

j) What is the dissipation factor of the dielectric?

## Section - B

*(4 × 5 = 20)*

*Q2)* A uniform transmission line has constants R = 12mΩ/ m, G = 1.4μJ / m , L = 1.5μH / m and C = 1.4nF / m. At 7 kHz find

(a) the characteristics impedance, and

(b) attenuation in dB/km.

*Q3)* Derive the relation between VSWR and reflection coefficient in the terminated uniform transmission line.

*Q4)* A signal of 10 V is applied to a 50 Ω coaxial transmission line terminated in a 200Ω load. Find

(a) the voltage reflection coefficient. and

(b) the magnitude of the reflected voltage.

*Q5)* Derive the expression for the reflection and transmission coefficients for an uniform plane wave incidence normally on the planer interface between two unbounded medium.

*Q6)* Derive the wave equations for the non-magnetic lossless medium.

## Section - C

*(2 × 10 = 20)*

*Q7)* Derive the expression for cutoff wavelength and phase velocity of TE mode for a cylindrical waveguide.

*Q8)* An air-filled rectangular waveguide is to be constructed for single mode operation at 15 GHz. Specify the guide dimensions, *a* and *b*, such that the design frequency is 10 percent higher than the cutoff frequency of the $TE_{10}$ mode, while being 10 percent lower than the cutoff frequency of the next higher order mode.

*Q9)* Derive the expression for the attenuation in the parallel plate guide for TE mode.

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