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Total Number of Pages : 02

B.Tech.
PCEC4205

4th Semester Back Examination 2017-18
ELECTROMAGNETIC FIELDS AND WAVES

BRANCH : ECE, ETC, EEE

Time : 3 Hours

Max Marks : 70

Q.CODE : C1178

Answer Question No.1 which is compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

Answer all parts of a question at a place.

Q1 Answer the following Questions : (2 x 10)

- Why current density is considered as vector quantity, when current is a scalar quantity?
- Represent Laplace and Poisson equation with proper condition.
- Distinguish between oblique and normal incidence. Show by a sketch.
- Calculate the charge density at $(1, \pi/4, 3)$ due to an electric flux density $D = z\rho \cos^2 \phi a_z \text{ C/m}^2$.
- Convert points P(1,3,5) from Cartesian to cylindrical co-ordinates.
- Define attenuation constant and phase constant of a medium.
- What is polarization vector? What is class A type di-electric?
- How do you differentiate TEM, TE and TM waves?
- Explain the term dipole and dipole moment.
- What is dominant mode? Explain.

Q2 a) Derive wave equation for conducting medium. (5)

b) Write Maxwell's equation in phasor form. (5)

Q3 Describe in details the various co-ordinates systems used in electromagnetics. (10)

Q4 a) Derive an expression for power flow unit area in uniform plane wave. (4)

b) What must be the width of a rectangular wave guide such that the energy of electromagnetic radiation whose free space wave length is 30cm travels down the guide at 95% of the speed of light? (6)

Q5 a) $\Delta \times H = J + \frac{dD}{dt}$. Prove it by explaining equation of continuity and Ampere's law. (5)

b) What is current density and electric field intensity corresponding to a drift velocity of $5.3 \times 10^{-4} \text{ m/s}$ in aluminum? Conductivity of aluminum = $3.82 \times 10^7 \text{ S/m}$ and mobility = $0.00014 \text{ m}^2/\text{V.S}$ (5)

Q6 a) Derive the expression for electric field intensity due to a infinite line charge. (5)

b) A conducting circular loop of radius 20cm lies in the $Z=0$ plane in a magnetic field $B = 10 \cos 377t a_z \text{ mW/m}^2$. Calculate the induced voltage in the loop? (5)

