Registration No :

Total Number of Pages : 02

B.Tech
PEL3I001

3rd Semester Regular / Back Examination 2018-19
ELECTROMAGNETIC THEORY
BRANCH : EEE
Time : 3 Hours
Max Marks : 100
Q.CODE : E887
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1		**Short Answer Type Questions (Answer All-10)**	**(2 x 10)**
	a)	If $V = xz - xy + yz$, express V in cylindrical coordinates.	
	b)	Define Divergence Theorem.	
	c)	What is electric flux density? Write the relation with electric field.	
	d)	State the Uniqueness theorem.	
	e)	State Ampere's circuit law.	
	f)	Discuss the skin depth of the medium.	
	g)	Discuss dipole moment of an electric dipole.	
	h)	What do you mean by attenuation constant? Write its significance.	
	i)	Write the characteristic of the wave.	
	j)	What is Polarization ?What are its types.?	

Part- II

Q2   **Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6 x 8)**

a) Given vectors $A = 2a_x + 4a_y + 10a_z$ and $B = -5a_\rho + a_\emptyset - 3a_z$, find
    a. A+B at P (0, 2, -5)
    b. The angle between A and B at P
    c. The scalar component of A along B at P

b) Let $D = 2\rho z^2 a_\rho + \rho cos^2\emptyset a_z$ Evaluate

    a. $\oint_s D.dS$

    b. $\int_v \nabla.D \, dv$
       Over the region defined by $2 \leq \rho \leq 5, -1 \leq z \leq 1, 0 < \emptyset < 2\pi$

c) Establish the relation between Electric field and Electric potential.

d) Discuss the boundary condition of dielectric-dielectric boundary with dielectric constant $\varepsilon_{r1} \& \varepsilon_{r2}$ and discuss the law if refraction of electric field.

e) Calculate the capacitance of Spherical capacitor.

f) What is method of image? Discuss the case where the point charge is above a grounded conducting Plane.

g) Calculate the magnetic field intensity of an infinitely long coaxial transmission line.

h) A rectangular coil of area 10cm^2 carrying current of 50 A lies on plane 2x+6y-3z=7 such that the magnetic moment of the coil is directed away from the origin. Calculate the magnetic moment.

i) Give the detail classification of magnetic materials.

j) Define uniform plane wave propagation. Discuss its properties. A uniform plane electromagnetic wave propagating in air is given by $E = ix \cos[wt - \frac{2\pi}{\lambda}y]$ .Derive by using the Maxwell's equations, the expression for the vector magnetic field.

k) State Poynting Theorem. Give an expression for Poynting Theorem.

l) In a certain medium $E = 10 \cos(2\pi \times 10^7 t - \beta x)(a_y + a_z)$V/m
    If $\mu = 50\mu_0, \varepsilon = 2\varepsilon_0 \, and \, \sigma = 0, find \, \beta \, and \, H$

Part-III

Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Find conduction & displacement current densities in a material having conductivity of 10^{-3} S/m & ϵ_r = 2.5 if the electric field in the material is E = 5.0 × 10^{-6} sin (9.0 × 10^9t) V/m. **(8)**

b) Two point charges in free space are separated by a distance d and exert a force 2.6nN on each other. The force becomes 1.5nN when the free space is replaced by a homogeneous dielectric material. Calculate the dielectric constant of the material. **(8)**

Q4 An electric field in free space is given by $E = 50\cos(10^8 t + \beta x)\, a_y V/m$, **(8)**
    a) Find the direction of wave propagation
    b) Calculate β and the time it takes to travel a distance of $\lambda/2$.

Q5 **a)** An electron with velocity $u = (3a_x + 12a_y - 4a_z) \times 10^5 m/s$ experences no net force at a point in a magnetic field $B = 10a_x + 20a_y + 30a_z mWb/m^2$. Find 'E' at that point. **(8)**

b) The finite sheet $0 \le x \le 1, 0 \le y \le 1$ on the z=0 plane has a charge density $\rho_s = xy(x^2 + y^2 + 25)^{3/2}\, nC/m^2$. Find **(8)**
    a. The total charge on the sheet
    b. The electric field at (0,0,5)
    c. The force experienced by a -1mC charge located at (0,0,5)

Q6 **a)** Derive the transmission line equation. **(8)**

b) A conducting circular loop of radius 20cm lies in the z=0 plane in a magnetic field B= 10 cos 377t a_zmWb/m^2. Calculate the induced voltage in the loop. **(8)**