Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**

PET4I101

4th Semester Regular / Back Examination 2018-19

ELECTROMAGNETICS ENGINEERING

BRANCH : ECE, ETC

Max Marks : 100

Time : 3 Hours

Q.CODE : F260

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 **Only Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) What is the unit of $\nabla \times H$?

b) Deduce potential and electric field relations with respect to distance for dipole charge particles.

c) Find α and β for good conductor.

d) In EM wave propagation the component of electric field is given by $E = 10\sin(10^8 t - \beta z)a_x \frac{V}{m}$ Find the direction of EM wave.

e) What is the difference between Transmission line and wave guide.

f) If $\nabla g\vec{A} = 0$ and $\nabla \times \vec{B} = 0$, then write the behavior of $\vec{A}$ and $\vec{B}$.

g) If one unit magnitude of electric field (V/m) exist on dielectric material of $\varepsilon_r = 2$ then find energy density of the medium.

h) What do you mean by susceptibility and how it is related to electric field, permeability and flux density?

i) There are two dielectric materials stacked to each other and one is twice times denser than other. If electric field will incident at 45^o at the interface then find angle of transmission with interference.

j) Write down cutoff frequency of waveguide where 'a=b' at TM_{11} mode.

Part- II

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

a) Given that E = $(3x^2+y)a_x + xa_y$ KV/m, find the work done in moving a -2 μC charge from (0,5,0) to (2,-1,0) by taking straight line path.

b) Explain Uniqueness theorem and implement in mentioned problem. Two parallel conducting planes in free space are at y=0 and y=0.02m and the zero voltage references at y=0.01m. If **D**=253ay nC/m^2 between the conductors, determine the conductor voltages.

c) Determine $\vec{D}$ at (4,0,3), if there is a point charge -5π mC at (4,0,0) and line charge 3π mC/m along the Y-axis.

d) Two parallel conducting planes in free space are at y=0 and y=0.02m and the zero voltage references at y=0.01m. If **D**=253ay nC/m^2 between the conductors, determine the conductor voltages.

e) A 10 C/mcharge distribution aligned along'Z' axis in infinite length of wire. Find out electric field intensity at (0,6,0).

f) A 10mA current passing through on infinite length of wire aligned along 'Z' axis. Find out magnetic field at (0,6,0).

g) The plane z=0 makes the boundary between free space and a dielectric medium with a dielectric constant of 10. The $\vec{E}$ field next to the interface in free space is $\vec{E} = 14\hat{a}_x + 22\hat{a}_y + 4\hat{a}_z$ V/m. Determine the $\vec{E}$ field on the other side of the interface.

h) Derive Ampere's Law for both conservative field and Time varying field. Explain duality of Maxwell's equation.

i) A 1.8 GHz wave propagates in a medium characterized by $\mu_r = 1.6, \varepsilon_r = 25, \sigma = 25\frac{S}{m}$.

The electric field intensity in the region is given by $E = 0.1e^{-\alpha z}\cos(2\pi - \beta z)a_x \frac{V}{m}$.

Determine corresponding H field, β and α .

j) Write short notes on Poisson's and Laplace's Equation.

k) Derive the equation of a Impedance of Transmission Line.

l) Describe in detail about the Helmholtz's Wave equation.

Part-III

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

Q3 Find rectangular to cylindrical & Spherical coordinate transformation for unit vectors matrix with complete diagram. **(16)**

Q4 Write difference between transmission line and wave guide. Find cutoff frequency of a rectangular wave guide at TE_{01} mode and TM_{11} mode. **(16)**

Q5 Derive differential Poynting theorem. Deduce average power over E and H field and also over Time. **(16)**

Q6 Semi-infinite conducting planes at ϕ=0 and ϕ=π/ 6 are separated by an infinitesimal insulating gap. If V(ϕ=0)=0 and V(ϕ=π/ 6)=100V, Calculate V and E in the region between the planes. **(16)**