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

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

PCEC4205

4th Semester Back Examination 2018-19

ELECTROMAGNETIC FIELDS AND WAVES

BRANCH : ECE, EEE

Time : 3 Hours

Max Marks : 70

Q.CODE : F838

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

The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) Find the curl of a vector

$$V = i(x + 2y + az) + j(bx - 3y - z) + k(4x + cy + 2z)$$

b) Define the terms 'Electric intensity' and 'Electrical displacement density'.

c) What is difference between scalar magnetic potential and vector magnetic potential?

d) Give the expression for energy stored in static electric field.

e) Define magnetic field intensity and give its relation with magnetic flux density.

f) Define the Poynting vector. What is the SI unit for this?

g) Define & explain the skin depth.

h) What is standing wave ratio? Give its relation with reflection coefficient.

i) What is the dissipation factor of a dielectric?

j) Write the Maxwell's Equations for time varying magnetic field with its significance.

Q2 **a)** State the divergence theorem & derive the equation for divergence theorem. Also find the divergence of $A = (2x)a_x - (3y^2)a_y + (xz)a_z$ **(5)**

b) Write about equation of continuity and inconsistency of Ampere's Law. **(5)**

Q3 **a)** Prove that in a travelling plane electromagnetic wave there is a definite ratio between the amplitudes of E and H and find this ratio. **(5)**

b) Write shorts of the following **(5)**

a. Magnetic vector potential
b. Helmholtz equation

Q4 **a)** State and explain the electrostatic boundary conditions existing at the boundary between two dielectrics having dielectric constant ε_{r1} & ε_{r2}. **(5)**

b) Using vector potential concept, find the magnetic intensity about a long straight wire carrying current I. **(5)**

Q5 **a)** Calculate skin depth, propagation constant wave velocity at a frequency of 1.6MHz in aluminum where $\sigma = \frac{38.2MS}{m} and\ \mu_r = 1$. **(5)**

b) What is Method of Images and proof it for a point charge above the grounded conducting plane. **(5)**

Q6 **a)** What is a uniform plain wave? Derive the relation between E & H in a uniform plane wave. **(5)**

b) In a Rectangular wave guide for which *a=2b, fc* for TE_{02} mode is 12GHz. Find the cut off frequency for TM_{11} mode. **(5)**

Q7 **a)** Two point charges -4μC and 5μC are located at (2,-1,3) & (0,4,-2) respectively. Find the potential at (1,0,1) assuming zero potential at infinity. **(5)**

b) Derive Laplace's and Poisson's equations from Gauss's law for a linear material medium. State the importance of this equation. **(5)**

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Magnetic Materials

b) Torque and Magnetic Force

c) Polarization