(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2017

Paper Code: ETEE 210 **Subject: Electromagnetic Field Theory**

[BATCH: 2013 ONWARDS]

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt any five questions including Q.No. 1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1. a) The concept of displacement current was introduced by whom?
b) Explain the conditions when a field is solenoidal and when irrotational.
c) If F=grad $[(x^3+y^3+z^3)-3xyz]$. Find curl F?
d) What is the attenuation constant if the penetration depth of an EM Wave is 2mm.
e) What are the values of the E & H components if the EM Wave is propagating along the x-axis?
f) What is the condition for the transmission line to be distortion free?
g) A plane wave in a homogeneous medium has $E=50 \sin (10^8t+2z)i_y$ V/m. What is the direction of wave propagation and of E.
h) What is the physical significance of $\sigma/\omega\varepsilon$ in E M Waves propagating in a medium?
i) Write the SI units for permittivity and permeability.
j) What was the inconsistency in Ampere's Law? **(2.5x10=25)**

Unit-I

Q2. a) Give a vector function $A= (x+c_1z)I_x+(c_2x-3z)\ I_y+(x+c_3y+c_4z)\ I_z$ **(6)**
i) Calculate the values of C_1, C_2, C_3 if **A** is irrotational.
ii) Determine the constant C_4 if **A** is also solenoidal.

b) Deduce the equation of Poisson and Laplace expressing the relationship of space rate of variation of potential with the distributed charge field? **(6.5)**

Q3. a) Transform the vector $A= \hat{I}\theta + \hat{I}\phi$ to Cartesian co-ordinates system. **(6.5)**
b) Find the Laplacian of the scalar field $V=\rho z \sin \varnothing+z^2 \cos^2\varnothing+ \rho^2$. **(6)**

Unit-II

Q4. a) State and explain Biot and Savart's law in magneto-statics. Apply this law to find the magnetic fields due to surface current and volume current distributions. **(6.5)**

b) Explain the Method of Images in electrostatics and apply it to derive an expression for a point charge. **(6)**

Q5 (a) Derive the boundary conditions at the interface of two magnetic mediums with no current at the boundary. **(6)**
(b) There exists a boundary between two magnetic mediums at $z = 0$, $\mu_1 = 4\ \mu_0$ H/m in region 1, $z > 0$, and $\mu 2 = 7\ \mu_0$ in region 2, $z < 0$. If the flux density in the region 1 is $\mathbf{B_1} = 2\mathbf{i_x} - 3\ \mathbf{i_y} - 2\ \mathbf{i_z}$. Find $\mathbf{B_2}$ and $\mathbf{H_2}$ in region 2. There is no current at the boundary. **(6.5)**

P.T.O.

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