Exam.Code:0935
Sub. Code: 6984

2021

B.E. (Electrical and Electronics Engineering)

Fifth Semester

EE-508: Electromagnetic Fields Theory

Time allowed: 3 Hours Max. Marks: 50

***NOTE**: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Use of scientific calculator is allowed.*

x-x-x

I. (a) Transform the vector $\mathbf{B}= y\mathbf{a}_x - x\mathbf{a}_y + z\mathbf{a}_z$ into cylindrical coordinates. **(2)**

(b) Write down the wave equation for E and H in a conducting medium. **(2)**

(c) What is the electric field around long transmission line? **(2)**

(d) Write down the magnetic boundary conditions. **(2)**

(e) Draw magnetic field pattern inside and outside circular conductor with uniform current Density. **(2)**

Part- A

II. (a) Consider two co-planar vectors $\bar{A} = 3\bar{a}_x + 4\bar{a}_y - 5\bar{a}_z$ and $\bar{B} = -6\bar{a}_x + 2\bar{a}_y + 4\bar{a}_z$ obtain

(i) cross product of $\bar{A}$ and $\bar{B}$.

(ii) unit vector normal to the plane containing the vectors $\bar{A}$ and $\bar{B}$. **(6)**

(b) Derive the expression for energy density in electrostatic fields. **(4)**

III. (a) For a vector field A, show explicitly that $\Delta.\Delta \times A=0$: that is the divergence of the curl of any vector field is zero. **(5)**

(b) Find electric field E at P(1,1,1) caused by four identical charges of 5nC each located at $P_1(1,1,0)$, $P_2(-1,1,0)$, $P_3(-1,-1,0)$ and $P_4((1,-1,0)$. **(5)**

IV (a) Using Laplace's equations find the potential V between two concentric circular cylinders, if the potential on the inner cylinder of radius 0.1 cm is 0V and that on the outer cylinder of radius 1 cm is 100 V. **(5)**

(b) A uniform line charge L =25Nc/m lies on the x=3m and y=4m in free space . Find the electric field intensity at a point (2,3,15)m. **(5)**

P.T.O.

Part-B

V. (a) Derive the expression for co-efficient of coupling in terms of mutual and self inductance. (5)

(b) Derive Bio-Savart's and Ampere's law using vector magnetic potential why it is vector otherwise its electric equivalent is scaler quantity. (5)

VI. (a) Find H at the center of an equivalent triangular loop of side 4m carrying current of 5A. (5)

(b) Derive Maxwell's equations in integral form for free space and harmonically varying fields. (5)

VII (a) Derive wave equation in phasor form. (5)

(b) By integrating poynting vector over the cross section of a coaxial cable, show that the total power carried by cable is VI, where V is voltage and I is current. (5)

x-x-x