Exam.Code:0935
Sub. Code: 6670

2122

B.E. (Electrical and Electronics Engineering)
Fifth Semester
PC-EE-503: 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)** Points P and Q are located at (0,2,4) and (-3,1,5). Determine the distance vector from P to Q. **(2)**

(b) How can a vector field be expressed as the gradient of scalar field. **(2)**

(c) Using Gauss law, derive the capacitance of coaxial cable. **(2)**

(d) Draw variation of H inside and outside a circular conductor with uniform current density. **(2)**

(e) What do you mean by energy density in electrostatic fields. **(2)**

Part- A

II. **(a)** Express the vector filed $\overline{A} = xy^2z\bar{a}_x + x^2yz\bar{a}_y + xyz^2\bar{a}_z$ in cylindrical and spherical co-ordinates at (3,-4, 5). **(5)**

(b) Determine divergence and curl of vector at $(5, \frac{\pi}{2}, 1)$

$$\overline{A} = \rho^2 cos^2\varphi\bar{a}_\rho + z\, sin\varphi\bar{a}_\varphi$$ **(5)**

III. (a) Calculate flux density at a point (6,4,-5) caused by
(i) a point charge of 20mC at the origin.
(ii) a uniform charge density =60μC/m^2 at a plane x=8. **(5)**

(b) Derive an equation for calculating the capacitance of coaxial cable. **(5)**

IV (a) Derive Maxwell curl equation for static electric field. **(5)**

(b) Derive Poisson's and Laplace in cartesian co-ordinates from Gauss law in point form and also write them in cylindrical and spherical systems. **(5)**

Part-B

V. **(a)** Derive the boundary condition at the interface between two magnetic materials of different permeabilities. **(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)**

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

(b) Find the frequency when the displacement current density and conduction current density are equal in a medium with $\sigma=2\times10^{-4}$ ℧/m and $\varepsilon_r=81$. **(5)**

VII (a) Derive wave equation from Maxwell's equation for free space. **(5)**

(b) Solve wave equation for a uniform plane wave in a isotropic homogenous lossy dielectric medium with no sources. Calculate the propagation constant, attenuation consent and phase constant. **(5)**

x-x-x