Exam.Code:0935
Sub. Code: 6670

2123

B.E. (Electrical and Electronics Engineering)
Fifth Semester
PC-EE-503: Electromagnetic Fields Theory

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt <u>five</u> 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) State the condition for the vector F to be solenoidal. (2)

(b) What are the physical differences between Poisson's and Laplace's equations. (2)

(c) What do you mean by conservative property of electric field. (2)

(d) What are the properties of uniform plane waves. (2)

(e) How does displacement current different from conduction current. (2)

Part- A

II. (a) Derive wave equations in terms of electric and magnetic fields for a conducting medium. (5)

(b) Consider charge of 1C at (2,0,0), What charge must be placed at (-2, 0, 0) which will Make y component of total $\bar{E}$ zero at the point (1 ,2 2) (5)

III. (a) Derive the expression of electric field Intensity due to infinite line of charge in Cartesian coordinate system. (5)

(b) Derive an expression for the electrostatic energy stored in a parallel plate capacitor. (5)

IV (a) The region between two concentric right circular cylinders contains uniform charge Density ρ. Solve the Poisson's equation for the potential in the region. (5)

(b) Obtain Laplace equation in cartesian co-ordinate systems and obtain the solution when V is function of x only for the boundary condition $V=V_1$ at $x=x_1$ and $V=V_2$ at $x=x_2$. (5)

Part-B

V. (a) A 'z' directed current distribution is given by $\bar{J} = (r^2 + ur)$ for $r \leq \alpha$. Find $\bar{B}$ at any point $r \leq \alpha$ using Ampere's circuital law. (5)

(b) Find Magnetic field intensity at point P (1.5, 2, 3) caused by current filament of 24A in a_z direction on the z-axis and extending from z=0 to z=6. (5)

VI. (a) State and prove magnetic boundary conditions. (5)

(b) Using Bio-Savart's law, derive an expression for the magnetic field intensity at any point on the line through the center at a distance 'h' from the center and perpendicular to the plane of a circular loop of radius 'ρ' and carrying current 'I'. (5)

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VII (a) Starting from basic principle, derive the Maxwell's equations in both integral and point form. (5)

(b) A charge q is moving with uniform velocity v. Obtain its poynting vector and show that energy propagates along with moving charge. (5)

x-x-x