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JAYA GROUP OF INSTITUTIONS – THIRUNINRAVUR

IV SEM – B.E

INTERNAL ASSESSMENT – 1 (MODEL EXAMINATION- 1)

Sub. Name :Electromagnetic Fields

Date :30.01.15

Sub. Code :EC6403

Branch :ECE

Duration :180 minutes

Max. Marks:100

Part A - (10 x 2=20) Answer all the Questions:

1. Find the gradient of a scalar system $t=x^2y + e^z$ at point $P(1,5,-2)$.
2. A parallel plate capacitor has an area of 0.8m^2 separation of 0.1mm with a dielectric for which $\epsilon_r=1000$ & a field of 10^6 V/m . Calculate capacitance(C) & potential(V).
3. Convert the given rectangular co-ordinate $A(x=2, y=3, z=1)$ into the corresponding cylindrical co-ordinate.
4. A point charge $+2\text{nC}$ is located at the origin. What is the value of potential at $P(1,0,0)\text{m}$?
5. What is an electric dipole? Write the potential due to an electric dipole.
6. Give the expression for the capacitance of a parallel plate capacitor.
7. Write the continuity equation for current. Write its significance.
8. State the difference between Poisson's equation and Laplace's equation. State the Laplace's equations in cartesian, cylindrical and spherical co-ordinate systems.
9. Write the basic properties of conductors.
10. Write the expression for R of a conductor for an uniform & non uniform fields.

Part B- (5 x 16=80) Answer the Questions As per the Choice:

- 11.a.i. State and prove Gauss's law (8)
 - ii.If $V=[2x^2y + 20y - 4/(x^2+y^2)]$ volts, find E & D at $P(6,-2.5,3)$. (8)
- Or
- 11.b.i. State and explain Divergence theorem & Stoke's theorem. (8)
 - ii.An infinitely long uniform line charge is located at $y=3, z=5$. If $\rho_h = 30\text{ nC/m}$,

find E at origin, $P(0,6,1)$ & $P(5,6,1)$. (8)

12. a.i. Verify Stoke's theorem for a vector field, $F = r^2 \cos\Phi \mathbf{a}_r + z \sin\Phi \mathbf{a}_z$ around the path '1' defined by $0 \leq r \leq 3$, $0 \leq \Phi \leq 45^\circ$ and $z = 0$. (8)

ii. Define potential difference & obtain the expression for electric potential. (8)

Or

12.b.i. Given the two points $A(x = 2, y = 3, z = -1)$ and $B(r = 4, \Theta = 25^\circ, \Phi = 120^\circ)$.

Find the spherical co-ordinates of A and cartesian co-ordinates of B . (8)

ii. Calculate the potential differences for different configurations. (8)

13.a.i. Obtain the expression for energy stored and energy density in a capacitor. (12)

ii. Three point charges 1,2,3 Coulombs are situated in free space at the corners of an equilateral triangle of side 1m. Find the energy stored in the system. (4)

Or

13.b. Derive the capacitances for parallel plate, coaxial & spherical capacitors. (16)

14.a. Explain polarization & derive permittivity. (16)

Or

14.b. Obtain the solution to Laplace's equation. (16)

15.a.i. Write the applications of Laplace's equation. (8)

ii. Two parallel conducting plates are separated by a distance 'd' apart and filled with dielectric medium having relative permittivity ϵ_r . Using Laplace's Equation, derive an expression for capacitance per unit length of it, if it is connected to a DC source supplying 'V' volts. (8)

Or

15.b. Derive the boundary relations at the boundary for the perfect dielectric materials. (16)P