

Code No: 153AR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B.Tech II Year I Semester Examinations, September - 2021****ELECTROMAGNETIC FIELDS****(Electrical and Electronics Engineering)****Time: 3 hours****Max. Marks: 75****Answer any five questions****All questions carry equal marks**

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- 1.a) State and explain Gauss Law.
b) A Point charge of 20nC is located at (4,-1,3) and a uniform Line charge of -25nC/m lies along the intersection of the planes $x = -4$ and $z = 6$. Calculate D at (3,-1,0). [7+8]
- 2.a) Derive Electric Field Intensity at a point due to surface charge.
b) Given the surface charge density, $\rho_s = 2\mu\text{C}/\text{m}^2$, existing in the region $\rho < 0.2\text{m}, z = 0$, and is zero elsewhere, Find E at $P(\rho = 0, z = 0.5)$. [8+7]
- 3.a) Derive Equation of Continuity.
b) Let $V = \frac{(\cos 2\theta)}{\rho}$ in free space. Find the volume charge density at point $P(0.5, 60^\circ, 1)$. [8+7]
- 4.a) Derive capacitance of a two-wire line.
b) Obtain boundary conditions for Dielectric-Dielectric material. [8+7]
- 5.a) State Biot Savart's Law and Ampere's circuital Law.
b) Given points $C(5, -2, 0)$ and $P(4, -1, 2)$, a current element $IdL = 10^{-4} (4, -3, 1)\text{A}\cdot\text{m}$ at C produces a field dH at P . Specify the direction of dH by a unit vector a_H and also find $|dH|$. [8+7]
- 6.a) Derive Equation for self inductance of solenoid.
b) A conductor of length 2.5m located at $z = 0, x = 4\text{m}$ carries a current of 12.0A in the $-\mathbf{a}_y$ direction. Find the uniform \mathbf{B} in the region if the force on the conductor is $1.20 \times 10^{-2}\text{N}$ in the direction $(-\mathbf{a}_x + \mathbf{a}_z)/\sqrt{2}$. [8+7]
- 7.a) Explain statically and dynamically induced electro motive forces.
b) A certain material has $\sigma = 0, \mu = 1$. If $\vec{E} = 800\sin(10^6 t - 0.01z)\mathbf{a}_y \frac{\text{V}}{\text{m}}$. Make use of Maxwell equation to find ϵ_R . [7+8]
- 8.a) Derive electromagnetic Wave Equation.
b) State and explain Poynting Theorem. [8+7]

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