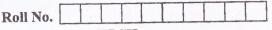
Printed Pages : 1



NEC404

B. TECH.

THEORY EXAMINATION (SEM-IV) 2016-17

ELECTROMAGNETIC FIELD THEORY

Time : 3 Hours

1.

Note: Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION - A

 $10 \ge 2 = 20$

Max. Marks: 100

- Attempt all parts of the following questions: Explain the physical significance of Divergence and Curl. (a)
 - Derive and expression for inductance per unit length of coaxial conductors. (b)
 - Express $B = \left(\frac{10}{r}\right) \alpha + r \cos \theta \alpha$ in cylindrical coordinates. (c)
 - Explain the terms Transmission coefficient and reflection coefficient. (d)
 - Prove the electric field vector E = (grad V), where V is a scalar potential field. (e)
 - Transform the point (1, 1, 6) to spherical coordinates. (f)
 - Verify whether the scalar field $S = \rho^2 z cos 2\Phi \times in$ cylindrical coordinates in a (g) solution of Laplace's equation.
 - A copper wire carries a conduction current of 1 amp at 60 Hz. What is the displacement (h) current in the wirte? Assume $\mu = \mu_0$, $\varepsilon = \varepsilon_0$ and $\sigma = 5.8 \times 10^7$ ohm/m.
 - State Stroke's theorem and Divergence theorem. (i)
 - State the Gauss's law and derive the related Maxwell equation. (j)

SECTION - B

Attempt any five of the following questions: 2.

 $5 \ge 10 = 50$

- Derive and explain the mathematical form of Poynting theorem. (a)
- Given that $D = \left(\frac{5r^2}{4}\right)r$ in spherical co-ordinate. Find the volume enclosed between (b) r=1 and r=2.
- Explain the phenomenon of polarization and its types. (c)
- Prove that the magnetic field due to an infinite conductor carrying current i at a (d) distance r is $H = \frac{i}{2\pi r} A/m$
- Explain the tangential and normal boundary conditions between two dielectrics for (e) static electric fields.
- Calculate E at P(1, 1, 1) in free space caused by four identical 3-nC point charges (f) located at $p_1 = (1, 1, 0)$, $p_2 = (-1, 1, 0)$, $p_3 = (-1, -1, 0)$ and $p_4 = (1, -1, 0)$.
- State and explain Maxwell's equations for time varying fields in differential and (g) integral forms and their significance.
- A uniform plane wave propagating in good conductor. If the magnetic field intensity is (h) given by $H = 0.1e^{-15}\cos(2\pi \times 10^8 l - 15z) i$ A/m, determine the conductivity and corresponding component of E field. Also calculate the average power loss in a block of unit area and thickness t.

SECTION - C

$2 \ge 15 = 30$

- Attempt any two of the following questions: A uniform plane wave propagating in a medium has $E = 2e^{-az} \sin(10^8 t - \beta z) j$ V/m. 3 If a medium is characterized by $\varepsilon_r = 1$, $\mu_r = 20$ and $\sigma = 3$ S/m, determine α , β and H.
- Discuss the solution of plane wave equation in conducting media (Lossy Dielectric). 4 Derive the above up to Propagation Constant. Attenuation Constant and Phase Constant.
- Explain the reflection of plane wave for the normal incidence. Discuss about Reflection 5 and Transmission coefficient for F and H.