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Total Pages : 3

EC 402(MTU)

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 130402

Roll No. | | | | | | | | | | |

B. Tech.

(SEM. IV) THEORY EXAMINATION, 2014 15

ELECTRONIC FIELD THEORY

Time : 2 Hours] [Total Marks : 50

Note : Attempt all questions.

1 Attempt any four questions : 3.5×4=14

(a) Prove the vector triple product identity
$A \times B \times C = B(A.C) - C(A.B)$.

(b) What is the physical significance of gradient, divergence and curl.

(c) Evaluate div (curl A) if

$$A = \frac{\sin\phi}{r^2} a_r - \frac{\cos\phi}{r^2} a_r.$$

(d) State Divergence theorem and stokes's theorem.

(e) Express the vector in Cartesian coordinates

$$A = r^2 \widehat{a_r} + \sin\theta \widehat{a_\phi}.$$

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(f) Verify the following vector fields are irrotational and solenoidal

$$\vec{A} = yz\hat{a}_x + zx\hat{a}_y + xy\hat{a}_z.$$

Attempt any two questions : **6×2=12**

(a) Given the potential $V = \frac{10}{r^2}\sin\theta\cos\phi$. Find the electric flux density D at $(2, \frac{r}{2}, 0)$.

(b) Enlist the properties of conductors, dielectrics and semiconductors.

(c) Derive the expression for capacitance of spherical capacitor using gauss law. A spherical capacitor has radii a= 1.5 cm and b= 4cm has an inhomogeneous dielectric of $\varepsilon = \frac{10\varepsilon_0}{r}$. Calculate the capacitance of the capacitor.

Attempt any two questions : **6×2=12**

(a) State Biot Savarts's law. Prove that the magnetic field due to infinite conductor carrying conductor I at a distance r is $H = \frac{I}{2\pi r}$.

(b) State and explain Maxwell's equations. Discuss its physical significance.

(c) Derive an expression for energy in magnetic field.

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Any two questions : **6×2=12**

(a) Derive the expression of reflection and transmission coefficients. Derive the relation between two.

(b) State and Explain Poynting theorem

(c) A uniform plane wave propagating in medium has

$$E = 2e^{-\alpha z} \sin\left(10^8 t - \beta z\right) a_y \ V/m.$$

If a medium is characterized by $\epsilon_r = 2$, $\mu_r = 10$ and $\sigma = 5 S/m$. Find :

(i) Attenuation constant

(ii) Phase constant

(iii) Velocity of propagation

(iv) Propagation constant

(v) Intrinsic impedance.

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