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Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (Electrical & Electronics Engg./Electronics & Electrical Engg.)
(2018 Batch) (Sem.-3)

ELECTROMAGNETIC FIELDS

Subject Code : BTEEE-304-18

M.Code : 76466

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. State divergence theorem.
2. Distinguish between transformer and motional emf.
3. Derive the expression for divergence of a vector field in cylindrical coordinate system.
4. Explain skin depth.
5. If $\vec{A} = 2\hat{a}_x + 4\hat{a}_y$ and $\vec{B} = 6\hat{a}_y - 4\hat{a}_z$. Find the smaller angle between them using cross product. Verify it using dot product.
6. Find \vec{D} at P (6, 8 – 10) due to a point charge of 50 mC at origin.
7. State the significance of displacement current in the context of Maxwell's equations.
8. Calculate the Poynting vector at the surface of a cylindrical conductor of radius 'a' and conductivity σ carrying a steady current I distributed uniformly over its cross section.
9. Deduce Coulomb's law from Gauss's law.
10. Transform $\vec{A} = y\hat{a}_x + x\hat{a}_y + \frac{x^2}{\sqrt{x^2 + y^2}}\hat{a}_z$ to cylindrical coordinates.

SECTION-B

11. If the two vectors are represented by :

$$\vec{A} = 5\hat{a}_r + 2\hat{a}_\theta - \hat{a}_\phi$$

$$\vec{B} = \hat{a}_r - 3\hat{a}_\theta + 4\hat{a}_\phi$$

Find :

I. $\vec{A} \times \vec{B}$

II. Angle between \vec{A} and \vec{B}

III. Unit vector normal to the plane containing both \vec{A} and \vec{B}

IV. Vector projection of \vec{A} on \vec{B} .

12. Prove the vector identity : $\nabla^2 \vec{A} = \nabla(\nabla \cdot \vec{A}) - \nabla \times \nabla \times \vec{A}$.

13. State the necessity of magnetic vector potential for magneto-static fields.

14. Use Laplace equation to obtain the capacitance for a coaxial capacitor. Assume suitable coordinate system and boundary values.

15. A wire in the form of a parabola carries current 3A. Calculate the magnitude of the magnetic field intensity at its focus if the distance from the focus to the apex (or vertex) is 20 cm.

SECTION-C

16. Derive both differential and integral forms of Ampere's Circuital Law for time-varying and time-harmonic fields.

17. Derive the expressions for α , β and η for a lossy dielectric medium.

18. A non-magnetic medium has an intrinsic impedance of $240\angle 30^\circ$. Find –

I. Loss tangent

II. Dielectric constant

III. Complex permittivity

IV. Attenuation constant at 1 MHz.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.