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

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

$\vec{B} = \hat{a}_r - 3\hat{a}_0 + 4\hat{a}_\phi$

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 : $\nabla^2 \vec{A} = \nabla(\nabla . \vec{A}) - \nabla \times \nabla \times \vec{A}$.

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.