

SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act,1956)

Course & Branch: B.E. – ECE/ETCE

Title of the paper: Engineering Electromagnetics

Semester: III

Sub.Code: 13304/25304 (2002/2003/2004/2005)

Date: 18-11-2006

Max. Marks: 80

Time: 3 Hours

Session: FN

PART – A

(10 x 2 = 20)

Answer ALL the Questions

1. State Divergence theorem.
2. Four like charges of $30\mu\text{C}$ each are located at the four corners of a square, the diagonal of which measures 8m. Find the force on a $150\mu\text{C}$ charge located 3m above the center of the square.
3. Write Poisson and Laplace's equations.
4. Write Kirchoff's voltage law.
5. State Biot Savart's law.
6. Prove that magnetic forces do not work.
7. Write the Faraday's law of induction.
8. Write Maxwell's equation in differential form.
9. Write the law of reflection.
10. What is meant by Brewster's angle?

PART – B

(5 x 12 = 60)

Answer ALL the Questions

11. (a) A metal sphere of radius 'a' carries a charge Q. It is surrounded out to a radius 'b', by linear dielectric material of permittivity ϵ . Find the potential at the center relative to infinity.

(b) State and prove Stoke's theorem.

(or)

12. (a) A pair of 200 mm long concentric cylindrical conductors of radii 50 and 100 mm is filled with a dielectric, $\epsilon = 10 \epsilon_0$. A voltage is applied between the conductors to establish an electric field

$\vec{E} = (10^6/r) \vec{r}$ (V/m) between the cylinders. Calculate the energy stored and determine the capacitance.

(b) Derive the expression for the energy stored in an electric field.

13. (a) Explain the method of images.

(b) Derive the continuity equation.

(or)

14. (a) Discuss the uniqueness theorems in electrostatics.

(b) Explain the boundary conditions for current density.

15. (a) Find the magnetic field a distance z above the center of a circular loop of radius R , which carries a steady current I .

(b) Write notes on magnetic vector potential.

(or)

16. (a) Discuss the boundary conditions for magnetic fields.

(b) Find the magnetic field at the center of a square loop, which carries a steady current I . Let R be the distance from center to side. Find the field at the center of a n -sided polygon, carrying a steady current I . Again, let R be the distance from the center to any side. Find the formula in the limit n (number of sides) tends to infinity.

17. (a) Give the Maxwell's equations in integral form.

(b) State and prove 'Flux Rule' for any loop moving in static magnetic field.

(or)

18. (a) Derive the expression for the energy stored in magnetic field.

(b) Explain the concepts of self and mutual inductance.

19. (a) Derive Poynting theorem. (8)

(b) Give the general wave equations. (4)

(or)

20. (a) Write short notes on wave polarization. (4)

(b) Discuss the reflection of plane waves at the interface of dielectrics at oblique incidence. (8)