



Reg. No. :

Name :

**Fourth Semester B.Tech. Degree Examination, February 2016
(2013 Scheme)**

13.403 : ENGINEERING ELECTROMAGNETICS (E)

Time : 3 Hours

Max. Marks : 100

PART – A

(10×2=20 Marks)

Answer **all** questions.

1. What are the different surfaces considered in cylindrical system of co-ordinates ?
2. Define linear charge density and surface charge density.
3. State Gauss's law.
4. Define electric field due to a dipole.
5. What is meant by dielectric strength ?
6. State Uniqueness theorem.
7. Distinguish between scalar and vector magnetic potentials.
8. Write down the expression for inductance of a Toroidal coil.
9. What are the properties of plane electromagnetic waves ?
10. What is the significance of intrinsic impedance ?

PART – B

(4×20=80 Marks)

Answer **any one full** question from **each** Module.

Module – 1

11. What are the different coordinate systems used to represent field vectors ?
Discuss them in detail with suitable examples.
12. a) State and prove Divergence theorem. 10
b) Three equal positive charges of 4 nano coulombs each are located at 3 corners of a square of side 20 cm. Determine the magnitude and direction of electrostatic force, electric field intensity and electric flux density at the vacant corner point of the square. 10



Module – 2

13. a) Deduce the relation between potential gradient and electric field. 10
 b) Find the potential at a point (3, 5, 2) due to two point charges, one located at (2, 0, 0) and the other at (-2, 0, 0). The charges are respectively $4 \mu\text{C}$ and $-5 \mu\text{C}$. (All distances are in metres). 10
14. a) Derive continuity equation of current in integral form. 10
 b) Two parallel charged metal plates are separated by a distance of 0.1 mm and charged to a p.d. of 100 V. If the charge is not allowed to leak off and the plates are now separated by 1 cm, what is the new p.d. between them? 10

Module – 3

15. a) Derive Laplace's and Poisson's equations and explain their significance in field theory. 10
 b) Two current filaments are parallel to the z-axis, one passes through (0, -0.5, 0) and carries 10A in a_z direction and the other passes through (0, 0.5, 0) and carries 100 A in a_z direction. Find the H_x on the y-axis. 10
16. Derive and discuss about the boundary conditions at the interface of two magnetic media.

Module – 4

17. From the fundamental laws derive the Maxwell's equations and the need for the Maxwell's contribution to electromagnetic theory.
18. Determine the amplitude of the reflected and transmitted E and H at the interface of two media with the following properties. Medium 1 : $\epsilon_r = 8.5$, $\mu_r = 1$, $\sigma = 1$. Medium 2 : Free space. Assume normal incidence and the amplitude of E in the medium 1 at the interface is 1.5 mV/m. Also derive the formulae used.