

Reg. No. :

**Question Paper Code : 20512**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2022.

Third/Seventh Semester

Electrical and Electronics Engineering

EE 8391 — ELECTROMAGNETIC THEORY

(Common to Electronics and Instrumentation Engineering/Instrumentation and Control Engineering)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Gauss law.
2. State Coulombs law.
3. List two applications of static electric field.
4. Differentiate conductors and dielectrics in terms of conductivity.
5. Relate magnetic flux density and magnetic intensity.
6. Define magnetization.
7. State Faradays law.
8. Outline field theory and circuit theory.
9. What is the value of intrinsic impedance for free space?
10. Differentiate lossy and lossless dielectric medium.

PART B — (5 × 13 = 65 marks)

11. (a) Illustrate divergence of a vector and derive divergence theorem. (13)

Or

- (b) Illustrate the electric field due to
- (i) infinitely long, charged conductor using Gauss law. (7)
  - (ii) uniformly charged circular disc using Gauss law. (6)
12. (a) Explain energy density in electrostatic fields and derive the expression for energy storage. (13)
- Or
- (b) Using Maxwell's equation, derive the conditions for electric field between two mediums mentioned below:
- (i) Dielectric 1 and Dielectric 2 (7)
  - (ii) Dielectric and conductor (3)
  - (iii) Dielectric and free space (3)
13. (a) Derive the magnetic field intensity due to a finite and infinite wire, carrying a current I. (9+4)
- Or
- (b) What are the laws involved in boundary condition and derive the conditions for magnetic field, between two mediums mentioned below:
- (i) Dielectric 1 and Dielectric 2 (7)
  - (ii) Dielectric and conductor (3)
  - (iii) Dielectric and free space (3)
14. (a) Derive displacement current from circuital analysis and from Ampere circuital law. (13)
- Or
- (b) State and derive Maxwell's equation in point form and integral form. (13)
15. (a) Illustrate the properties of uniform plane wave in free space. (13)
- Or
- (b) Illustrate the reflection of plane wave by dielectric medium under normal incidence. (13)

PART C — (1 × 15 = 15 marks)

16. (a) In a material for which  $\sigma = 5.5 \text{ s/m}$  and  $\epsilon_r = 1$  and  $E = 260 \sin 10^{10} t$  (V/m). Find the conduction and displacement current densities, and the frequency at which both have equal magnitudes. (15)
- Or
- (b) If  $V = \left[ 2x^2y + 20z - \frac{4}{x^2 + y^2} \right]$  volts.
- Evaluate E and D at point P (6, -2.5, 3) (8+7)