

## ELECTRICITY AND MAGNETISM – C

**Time Allowed : Three Hours]**

**[Maximum Marks : 75**

**Note :** Attempt *five* questions in all, selecting *one* from each of the Sections A, B, C and D. Section E is compulsory, attempt any *five* parts from it. Use of Non-Programmable calculator is allowed.

**Section : A**

1. Give physical interpretation of gradient, divergence and curl. 15  
2. (a) State and prove Gauss's divergence theorem. 10  
(b) Deduce Coulomb's law of force between the charges from Gauss law. 5

**Section : B**

3. (a) State and prove Stoke's theorem. 10  
(b) Find electrical potential at any point due to linear quadrupole. 5  
4. (a) Derive Poisson and Laplace equations; also discuss their solution. 10  
(b) What is the concept of electrical images. 5

**Section : C**

5. (a) Derive the equation of continuity. What is its form for steady current? 10  
(b) Explain Ohm's law from atomic point of view. Give its limitations.

6. Explain magnetic hysteresis and loss of energy due to hysteresis. Give uses of ferrites. 15

**Section : D**

7. (a) What is Biot Savart's law? Calculate magnetic field due to solenoid. 10  
(b) What is vector potential? Derive an expression for it. 5  
8. (a) Derive the relation for impedance of a series LCR circuit. 10  
(b) Discuss resonance condition in parallel LCR circuit. 5

**Section : E**

9. Explain brief notes on the following :  
(a) What is Bohr magneton? Calculate its value. (b) What is quality factor of resonance circuit?  
(c) Define retentivity and coercivity. (d) What are the limitations of Coulomb's law?  
(e) Why inductance is called electrical inertia? (f) Discuss importance of dielectrics.  
(g) What are the advantages of studying Hall effect?  
(h) Distinguish between charge invariance and charge conservation.

5×3=15