

9. (a) Find an equation that applies to series LCR resonant circuit without any emf source, and find a solution of obtained equation that leads to the condition for the oscillations in the case of low resistance. 4
- (b) A  $1000\ \Omega$  resistor, a  $500\ \text{pF}$  capacitor, and a  $2\ \text{mH}$  inductor are connected in series. What is the impedance of this combination at a frequency of 10 kilocycles per second ? 4

Roll No. ....

Exam Code : M-21

Subject Code—52478

**B. Sc. EXAMINATION**

(Batch 2017 Re-appear)

(First Semester)

PHYSICS

PH-102

Electricity Magnetism and Electromagnetic  
(Theory)

*Time : 3 Hours*

*Maximum Marks : 40*

**Note :** The question paper consists of nine questions. Q. No. 1 is compulsory. *Four* more questions are to be attempted, selecting *one* question out of two questions set from each Unit. Use of scientific (non-programmable) calculator is allowed.

1. (a) State and explain Gauss's law. 2 each  
(b) Define divergence of vector field.

- (c) What is diamagnetism ?
- (d) What is magnetic vector potential ?

### Unit I

2. (a) State and prove Gauss's divergence theorem. 4
- (b) Find grad  $a$ , where  $a = r^k$  and  $r = (x^2 + y^2 + z^2)^{1/2}$ . 4
3. (a) State and prove Stoke's theorem. 4
- (b) Find curl  $G$ , where  $G = \text{grad} (x^2 + y^2 + z^2 - 3xyz)$ . 4

### Unit II

4. (a) Discuss domain theory of ferromagnetism. What are important features of ferromagnetic materials ? 4
- (b) Discuss the phenomenon of hysteresis. What is the importance of hysteresis curve ? 4

5. (a) What is paramagnetism and how does it originate ? Write down five important features of paramagnetism materials. 4
- (b) What is magnetic flux ? Give its SI units. Discuss the two properties of magnetic field. 4

### Unit III

6. Derive Maxwell's electromagnetic equations for empty space. 8
7. (a) Define Poynting vector. What are its SI and CGS units ? 4
- (b) Derive an expression for Poynting vector. 4

### Unit IV

8. (a) What is Q factor of a resonant circuit ? How is the Q factor related to the amplitude of the oscillations ? 4
- (b) Derive an expression for Q factor of an LCR series resonant circuit. 4