

**23BPH451**  
**UG PROGRAM (4 YEARS HONORS) WITH SINGLE MAJOR**  
**AT THE END OF FOURTH SEMESTER**  
**PHYSICS - ELECTRICITY AND MAGNETISM (Minor)**  
**(w.e.f. Admitted Batch 2023-24)**

**Maximum: 70 marks**

**Time: 3 Hours**

**Section-B**

**5x4=20**

**Answer any FIVE Questions.**

1. What are equipotential surfaces? Give examples.
2. Define drift velocity and write its relation with current density.
3. State and explain the superposition theorem.
4. State and explain Biot-Savart's law.
5. State Faraday's law of electromagnetic induction.
6. Explain the concept of displacement current.
7. What is the Poynting vector, and what does it represent?
8. Write a short note on Power factor.

**Section -B**

**5x10=50**

**Answer ALL Questions.**

9. a) Find the electric field intensity due to a uniformly charged solid sphere at a point using Gauss's law.  
(Or)  
b) Define  $D$ ,  $E$  and  $P$  and obtain relation between them.
10. a) Derive the balancing condition for a Wheatstone bridge and explain its working principle.  
(Or)  
b) State and prove Norton's theorem.
11. a) Explain the Hall effect and derive the expression for the Hall coefficient.  
(Or)  
b) What is self-inductance? Derive an expression for the self-inductance of a long solenoid.
12. a) Derive Maxwell's equations in integral and differential forms.  
(Or)  
b) Hertz experiment on transverse nature of electromagnetic waves.
13. a) Explain the theory of LCR series circuit carrying A.C and explain resonance condition.  
(Or)  
b) Deduce the relation between current and voltage in a CR circuit and draw the phasor diagram.