K22U 0428

VI Semester B.Sc. Degree (CBCSS-OBE – Regular)
Examination, April 2022
(2019 Admission)
CORE COURSE IN PHYSICS
6B13PHY : Electrodynamics and Circuit Theory

Time : 3 Hours   Max. Marks : 40

SECTION – A (6 Marks)

(Short answer six questions. Answer **all** questions. **Each** question carries **1** mark).

1. Write the vector form of Ohm's law.

2. Write the differential form of Faraday's law of electromagnetic induction.

3. Velocity of light in a medium is given by _____

4. Write the relationship between wavelength and wave number.

5. Kirchhoff's 1st Law is applicable to only _____ in a network.

6. Unit of capacitance is _____

SECTION – B (12 Marks)

(Short answer eight questions. Answer **any six**. **Each** question carries **2** marks).

7. Define scalar and vector potentials.

8. Explain Maxwell's modification of Ampere's circuital theorem.

9. Derive wave equation in one dimension.

10. What do you mean by polarized light ? Explain.

11. State superposition theorem. What are ideal voltage and ideal current source ?

12. State and prove maximum power transfer theorem.

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13. A pure resistance R and a pure inductive coil of inductance L connected in series with an AC supply of voltage V. Find the average power consumed in a full AC cycle.

14. Explain resonance condition in LCR circuit. Define half power frequencies.

SECTION – C (12 Marks)

(Problem six questions. Answer **any four**. **Each** question carries **3** marks).

15. A uniform magnetic field B(t), pointing straight up, fills the circular region of radius b. If B changes with time, what is the induced electric field ?

16. Find self inductance per unit length of a long solenoid.

17. State Poynting's theorem. Find the average Poynting vector of an electromagnetic wave consist of electric field, $E = iE_0 \sin (kz - \omega t)$ and magnetic field $B = jB_0 \sin (kz - \omega t)$.

18. A voltage source delivers 4A when the load connected to it is 5 ohm and 2A when the load becomes 20 ohm. Calculate maximum power which source can supply.

19. Find the capacitance of two concentric metal shells, with radii a and b (a < b).

20. A charged 20 µF capacitor is connected to 30 mH inductor. What is the angular frequency of the oscillating circuit ?

SECTION – D (10 Marks)

(Long essay four questions. Answer **any two**. **Each** question carries 5 marks).

21. Explain Maxwell's equation in integral and differential form. Write significance of each equation.

22. Write Maxwell's equation in free space. Derive 3D wave equation for electric and magnetic field in an electromagnetic wave. Find equations for energy and momentum of electromagnetic waves.

23. State and explain Thevenin's theorem. Explain how a circuit can be Thevenize.

24. What are capacitors ? Explain the principle of a parallel plate capacitor with a dielectric between the plates. Derive an expression for the capacitance of a parallel plate capacitor with a dielectric of thickness t between the plates.