Reg. No ..... Name **24U506**

B. S. DEGREE END SEMESTER EXAMINATION - OCTOBER 2024

SEMESTER 5 : PHYSICS

COURSE : **19U5CRPHY05 : ELECTRICITY AND ELECTRODYNAMICS**

(For Regular 2022 Admission and Supplementary 2021/ 2020 / 2019 Admissions)

Time : Three Hours Max. Marks: 60

PART A

Answer any 8 (2 marks each)

1. Illustrate the variation of thermo e. m. f. as a function of temperature difference between the junctions.
2. State, what is meant by polarization of EM waves.
3. Give the work done to move a point charge from one point to another on an equipotential surface?
4. Comment on the net force and torque on a dipole placed in a uniform electric field.
5. An electric field of 10^5N/C points towards east at a certain point. What is the direction of the magnetic field also calculate the magnitude of the force on a charge -3μC placed at that point.
6. What is the physical concept of poynting theorem?
7. State, what is skin effect? How may we mitigate it?
8. Recall boundary conditions relating to magnetic field.
9. Illustrate voltage and current waveforms in a LR circuit.
10. Illustrate voltage and current waveforms in a capacitive circuit.

(2 x 8 = 16)

PART B

Answer any 6 (4 marks each)

11. The electric potential in a region of space is represented by $V = 2x + 3y - z$, derive the expression for the electric field strength.
12. An alternating potential of 100 V at 50 Hz is applied across a series circuit having an inductance of 5 Henry, a resistance of 100 ohm and a variable capacitance. At what value of the capacitance will the current in the circuit be in phase with the applied voltage? Calculate the current in this condition. What will be potential drops across the circuit elements?
13. Derive the wave equations of magnetic field.
14. An alternating voltage of 15 V at 120 Hz is applied to a choke of inductance 5 H and of resistance 2 ohms. Find the power factor of the coil and power absorbed.
15. A resistance R and an inductance L are connected to a battery of E volts. When will the potential difference across the inductance be equal to that across the resistance.
16. Explain how Maxwell corrected Ampere's Law.
17. In the case of a uniformly charged solid sphere, find the expression for the electric field, (a)inside the sphere (b) at the surface of the sphere and (c) out side the sphere.
18. If the charge on a capacitor of capacitance 2 micro farads which is leaking through a high resistance of 100 Mohms, is reduced to half its value, calculate the time of leakage.

(4 x 6 = 24)

PART C
Answer any 2 (10 marks each)

19. Derive Maxwell's equations for free space and matter.
20. Discuss the oscillatory growth of electric current in a LCR circuit.
21. State and prove reciprocity and maximum power transfer theorems.
22. Compare magnetostatics and electrostatics. Show one application of Gauss law and Amperes law.

(10 x 2 = 20)