QP CODE: 24028961

24028961

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, OCTOBER 2024

Fifth Semester

CORE COURSE - PH5CRT05 - ELECTRICITY AND ELECTRODYNAMICS

Common for B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications & B.Sc Physics Model III Electronic Equipment Maintenance

2017 Admission Onwards

7082EFBC

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. Why it is dangerous to connect a coil of inductance to DC source?
2. Define active and passive networks.
3. What is the difference between Peltier effect and Joule's heating effect?
4. Explain curl of a vector field.
5. What is an electric field? Is it a vector or scalar?
6. Difference between flux and flux density of an electric field.
7. Give some basic properties of electric conductors.
8. Prove that the tangential component of the electric field is continous across a boundary.
9. What is the significance of Magnetic vector potential?
10. State Faraday's Law of Electromagnetic Induction.
11. State and explain Flemming's right hand rule.
12. Why light is an electromagnet wave?

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. An electric lamp which runs at 40V and consumes 10A current is connected to AC mains at 100V, 50Hz. Calculate the inductance of the coil.

14. An LCR series circuit with L= 100μH, R= 5Ω and C= 0.0002μF. A voltage 10V is applied at resonant frequency. Verify that $E^2 = E_R^2 + (E_L - E_C)^2$.

15. A 60V, 10W lamp is to be run on 100V, 60 cycles main. Calculate the inductance of the choke coil required in the circuit. How much pure resistance is required would be required to achieve the same result?

16. Derive an expression for current at any instant when a capacitor.
    (i) charges through a resistance
    (ii) discharges through a resistance

17. Show that for a point charge, curl of electric field is zero.

18. Three charges each of value 2×10^{-5}C are arranged at the vertices of an equilateral triangle. Calculate the total electric potential energy of the system.

19. A charge of magnitude 3C is placed near a current carrying conductor producing a magnetic field of 6.2 T. If the charge is allowed to move through the field with a velocity 1.2×10^8 m/s, what is magnitude of force experienced by the charge if the electric field strength is 4.2×10^{-3} ?

20. A long vertical wire carries a current of 5 amperes and is placed in the earth's magnetic field. Find the position of the neutral point. Given earth's horizontal component BH = 6.3×10^{-5} web/m^2?

21. Prove by using Maxwell's equation that the velocity of propagation of electromagnetic waves through empty space is 3×10^8 m/s, same as velocity of light.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. Develop the phase relation between voltage and current in a circuit which contain inductor only, capacitor only and resistor only.

23. Derive an expression for decay of current through inductance L and resistance R in a circuit?

24. State and explain Ampere's Circuital law. Derive using this law an expression for magnetic field due to a long cylindrical wire and long solenoid.

25. State and explain Poynting's theorem? Explain its significance in electrodynamics.

(2×10=20)