QP CODE: 22100036

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Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, JANUARY 2022

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

08186CD8

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1. Show that the power consumed per cycle is zero for a circuit containing inductance only.
2. How various energy losses in a transformer can be minimised?
3. When an LCR circuit is said to be damped oscillatory?
4. State and explain divergence theorem.
5. State Coulomb's Law.
6. Distinguish between Scalar and vector fields.
7. Prove that the tangential component of the electric field is continous across a boundary.
8. What is Lorentz Force?
9. State Biot- Savart Law.
10. Explain the concept of magnetic vector potential. Obtain its relation with magnetic field.
11. What is the physical significance of Lenz's law?
12. State and explain one dimensional wave equation.

(10×1=10)

Part B

*Answer any **six** questions.*

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

13. Calculate the average value and rms value of an alternating voltage for its half cycle.

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 lead acid accumulator of emf 24V has an internal resistance of 0.01Ω. If the total power supplied is 100W, show that the system behaves as a constant voltage source

16. A thermocouple is constructed of gold and iron whose thermoelectric powers are (2.8+0.01θ) and (17.5 – 0.048θ) microvolts per degree centigrade respectively. What is the neutral temperature and maximum emf obtainable with this thermocouple?

17. Obtain expression for gradient operator in Cartesian, cylindrical and spherical coordinate systems.

18. Obtain an expression for the potential due to a point charge at a point r from the charge.

19. Obtain an expression for magnetic field at point due to a long cylindrical wire carrying a current I using Ampere's Circuital Law.

20. Find the magnitude and direction of magnetic flux if the magnetic vector potential is given by $2xz^2$ I ?

21. State and explain Poynting's Theorem.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Analyse the LR and CR circuit with AC is applied.

23. Discuss the growth of current in an LR circuit. Plot the curve relating the variation of current with time.

24. What is Gauss's Law in electrodynamics and discuss its significance? Using Gauss's law obtain an expression for the electric field due to a point charge at a point r distance from charge. A charge q sits at the back corner of cube. What is the flux of E through the opposite side of charge?

25. Derive the expression for energy density of an electromagnetic wave in free space.

(2×10=20)