23108093

QP CODE: 23108093

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) SPECIAL SUPPLEMENTARY EXAMINATIONS, APRIL 2023

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

2020 Admission Only

D787EC78

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1. Define the capacitive reactance, inductive reactance and impedance.
2. How various energy losses in a transformer can be minimised?
3. What is the time constant of a CR circuit in which there is growth / decay of current?
4. Explain divergence of a vector field?
5. State and explain Divergence theorem?
6. What is electric potential energy?
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. State Ampere's Circuital Law?
11. Distinguish between scalar and vector potentials?
12. Define current density? Obtain the 4th Maxwell's equation in terms of current density.

(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. A voltage V= 100sin(314t) is applied to a circuit consisting a 25Ω resistor and an 80μF capacitor in series. Find the (i) impedance, (ii) power consumed and p.d across the capacitor when the current is one half of the maximum value

15. A series circuit containing two pure elements has the following applied voltage and current; $V= 200\sin(2000t+50^0)$ and $I= 4\cos(2000t+13.2^0)$. Find the elements comprising the circuit

16. The cold junction of a thermocouple is kept at 270C. Calculate the temperature at which thermo emf would be maximum. Given that the thermo emf changes sign at 700K.

17. Find the electrostatic force of attraction between two charges of equal magnitude but opposite charge of magnitude 5×10^{-3} each separated by distance 10cm at a distance 6 cm from the positive charge?

18. State and Explain divergence and curl of electrostatic field.

19. Find the magnitude and direction of magnetic flux if the magnetic vector potential is given by $2xz^2\,\hat{i}$?

20. State Lenz's law and Flemming's right hand rule. Distinguish between lenz's law and Fleming's right hand rule.

21. Obtain Maxwell's equation in free space and matter?

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Compare the method of Norton theorem and Thevenins theorem in the circuit analysis

23. Discuss the charging and discharging of a capacitor through resistance. What is time constant?

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 long cylinder carries a charge density that is proportional to the distance from the axis : ρ = ks, for some constant k. Find the electric field inside the cylinder?

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

(2×10=20)