# DCPH 201

## II Semester B.Sc. Degree Examination, Oct./Nov. 2022
## (NEP Scheme)
## PHYSICS
## Electricity and Magnetism

Time : 2½ Hours Max. Marks : 60

***Instruction :*** ***Use*** *of non-programmable calculators is* ***permitted.***

PART – A

Answer **any six** questions. **Each** question carries **one** mark : **(1×6=6)**

1. What is a gaussian surface ?
2. Give the relation between electric field and electric potential at a point.
3. Why is an HTG preferable to a tangent galvanometer to measure currents ?
4. What is meant by critical damping ?
5. What is the internal resistance of an ideal current source ?
6. What is meant by wattless current ?
7. What are persistent currents in relation to a super conductor ?
8. Define the term "retentivity".

PART – B

Answer **any six** questions. **Each** question carries **two** marks : **(2×6=12)**

9. What is an electric dipole ? What will be the dipole moment of a dipole whose arm is zero ?
10. What is the physical significance of the gradient of a scalar function ?
11. How do you determine the Thevenin resistance of a circuit ?

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12. The distance between the plates of a parallel plate capacitor is d. If a metal plate of thickness $\frac{d}{2}$ is introduced between the plates, how does the capacitance change ?

13. Define mutual inductance between a pair of coils.

14. What are true power and virtual power as applied to ac circuits. What is the significance of the ratio of true power to apparent power ?

15. How does an accelerated charge produce electromagnetic waves ?

16. Classify hard and soft magnetic materials.

## PART – C

Answer **any three** questions. **Each** question carries **four** marks : **(3×4=12)**

17. In a certain region the electrostatic potential is given by the expression $V = 4x^2 + 3y^2 - 12z^2$. What is the electric intensity at a point (1, 2, 4 ) in this region ?

18. An ebonite plate (K = 3) 6 mm thick is introduced between the parallel plates of a capacitor of plate area $2 \times 10^{-2}\ m^2$ and plate separation 0.01 m. Find the capacitance.

19. The ac voltage and current in a circuit are given by $e = 110 \sin(\omega t + \pi/6)$ and $i = 5 \sin(\omega t - \pi/4)$respectively. Find the impedance and the average power dissipated in the circuit.

20. Approximately how large must be the magnetic induction, for the orientational energy to be comparable to the thermal energy at room temperature. Assume $\mu_m = 5\mu_B$.

## PART – D

Answer **any five** questions. **Each** question carries **six** marks : **(5×6=30)**

21. Obtain an expression for the electric field due to an infinite sheet of charge. **6**

22. State and prove the Norton's theorem. **6**

23. What are polar dielectrics ? Obtain an expression for the Gauss law in the presence of a dielectric. **(1+5=6)**

24. Obtain the relation $\sigma = \frac{ne^2\tau}{m}$ where the symbols have their usual significance.

    Mention one limitation of ohm's law. **(5+1=6)**

25. Obtain an expression for the magnetic field due to an infinitely long straight current carrying conductor at a point near one end. **6**

26. Obtain an expression for impedance of an L-R circuit supplied with an ac voltage $e = e_0 \sin\omega t$ using the j operator method. What are half power frequencies ? **(5+1=6)**

27. Derive the Maxwell's electromagnetic equations : $\nabla.B = 0$ and $\nabla \times E = -\frac{\partial B}{\partial t}$. **(3+3=6)**

28. a) Compare and contrast the different types of magnetic materials. **(2+4=6)**

    b) Mention any two properties and two applications of hard and soft magnetic materials.

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