NEP
B.Sc. II Semester Degree Examination, Sept./Oct. 2023
PHYSICS
DSC – A2 : Electricity and Magnetism

Time : 3 Hours   Max. Marks : 60

Instructions : 1) Part – **A** : **All** questions are **compulsory**.
                      2) Part – **B** : Answer **any five** questions.

PART – A

1. a) Define electric dipole moment. Write its SI unit.   (5×2=10)

   b) State Gauss's theorem.

   c) Mention the uses of series resonant circuit.

   d) Write Maxwell's equations in differential forms.

   e) What are hard magnetic materials ? Mention any one of the application.

PART – B

2. a) Obtain expression for the potential due to a uniformly charged conducting
      sphere at external and internal points.   (6+4=10)

   b) Two equal and similar charges 4 cm apart in air repel each other with a force
      equivalent to that of 3 kg.wt. Find the charge in coulomb.

3. a) Define capacity of a condenser. Derive an expression for the energy
      stored in a charged capacitor.   (6+4=10)

   b) Determine the area of parallel plate air capacitor if the capacitance of 25 nF
      and separation between the plates is 0.04 m.

4. a) Derive an expression for growth of charge in RC circuit.   (6+4=10)

   b) An electric current of 1 ampere is flowing in a wire of copper 0.01 cm^2
      cross-sectional area. What is the electrical field in the wire ? Take
      resistivity of copper = 1.6×10^{-8} Ωm.

5. a) State and explain Biot-Savart's law. (6+4=10)

  b) A current of 40 mA is passing through a coil of inductance 1000 mH. Find the magnetic energy stored in the coil.

6. a) Derive an expression for the current and phase difference between the applied emf and current in the AC circuit containing L and R. (6+4=10)

  b) Calculate the resonant frequency of LCR parallel resonant circuit with L = 10 mH, C = 1 μF and R = 1 kΩ.

7. a) Obtain the expression for equation of continuity. (6+4=10)

  b) Write a note on displacement current.

8. a) Give an account of Langevin's theory of diamagnetism and show that diamagnetic susceptibility is independent of temperature. (6+4=10)

  b) The magnetic susceptibility of the medium is 948×10^{-11}. Calculate the permeability (or absolute permeability) and relative permeability.

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Instructions : 1) Part – **A** : Answer **all** questions.
2) Part – **B** : Answer **any five** questions.

PART – A

Answer the following questions.   (10×1=10)

1. a) Define electric dipole.

   b) Write SI unit for electric flux.

   c) Define electrical potential.

   d) What is dielectric substance ?

   e) What is current density ?

   f) State Ampere's law.

   g) What is meant by electrical resonance ?

   h) Define impedance.

   i) Define magnetic moment.

   j) Define magnetic induction.

PART – B

Answer **any five** questions.

2. a) State Gauss theorem. Find the electric field intensity due to a line of charge of infinite length at a distance r from it.

   b) Consider a point charge $q = 2.2 \times 10^{-6}$ C. What is the radius of the equipotential surface having potential 32V ?   (7+3)

3. a) Define the capacity of a capacitor. Obtain an expression for the capacity of a parallel plate capacitor.

   b) 1μF capacitor is charged to 160 V. How many excess of electrons are there on plate ? Charge on electron is 1.6×10^{-19} C.   (7+3)

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4. a) Derive an expression for the growth of current in an L-R circuit.

   b) Calculate the electrical conductivity of the material of a conductor of length 4m, area of cross-section 0.02 mm², having a resistance of 3Ω. **(7+3)**

5. a) State and explain Biot-Savart's law.

   b) A current of 5A produces a flux of 2×10⁻³Wb through a coil of 500 turns. Calculate the energy stored in the magnetic field. **(7+3)**

6. a) Derive expression for current and impedance when an alternating emf is applied to a circuit having capacity and resistance in series.

   b) A.C. circuit contains 100 mH inductance and 10Ω as resistance. Calculate the power factor if the frequency of a.c. is 50 Hz. **(7+3)**

7. a) Write Maxwell's equation in differential form. Show that electromagnetic waves are transverse in nature.

   b) Mention the characteristics of displacement current. **(7+3)**

8. a) Give an account of Langevin's theory of diamagnetism and show that diamagnetic susceptibility is independent of temperature.

   b) An iron rod of density 7700 kgm⁻³ and specific heat capacity 460.4 Jkg⁻¹K⁻¹ is subjected to cycles of magnetization at the rate of 60 cycles per second. If the area of B-H curve for the specimen is 5000 joules, find the rise in temperature per minute of the specimen, assuming that the heat generated is not radiated. **(7+3)**

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B.Sc II Semester Degree Examination, April /May- 2019

PHYSICS

Heat, Thermodynamics and Waves and Oscillations

PAPER - 2.1

(New)

Time : 3 Hours   Maximum Marks : 60

Instructions to Candidates:

1)   Part A : Answer **all** questions

2)   Part B : Answer any **FIVE** questions

PART-A

1. Answer the following questions.   (10×1=10)

    a)   Define mean free path .

    b)   State first law of thermodynamics.

    c)   State carnot's theorem .

    d)   Define entropy.

    e)   Define temperature of inversion.

    f)   What is a black body ?

    g)   What is a free-free rod ?

    h)   What is progressive wave ?

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i).   Define resonance.

j)   What are beats?

PART-B   (5×10=50)

2. a) State and prove the principle of equipartition of energy.

    b) Calculate the rms velocity of oxygen molecules at 27°C. Pressure of oxygen at NTP=$1.0129 \times 10^5 N/m^2$ and density of oxygen at NTP = $1.43\ kg/m^3$.   (7+3)

3. a) What is heat engine ? Derive an expression for the efficiency of heat engine in terms of temperature of source and sink.

    b) The efficiency of carnot engine is 50% when the temperature of the sink is 400k. Find the temperature of the source.   (7+3)

4. a) Derive clausius - claypeyron's latent heat equation.

    b) Find the increase in boiling point of water at 100°C .When pressure is increased by one atmosphere. Given density of water = $1\ kg/m^3$ and latent heat of vapourisation = 2.268×10^6 J kg.   (7+3)

5. a) Explain production of low temperature by adiabatic demagnetisation.

    b) Explain in brief regenerative cooling   (7+3)

6. a) Derive plank's law of radiation and deduce weins displacement law from it.

    b) A perfectly black body of surface area $0.04m^2$ is at 427°C and is placed inside an encloser at 27°C. what is the rate of loss of heat. Assume $\sigma = 5.7 \times 10^{-8} wm^{-2} k^{-4}$.(7+3)

7. a) Derive Newton's formula for velocity of sound in air.

    b) Velocity of sound in air at 14°C is 340m/sec what will be the velocity of sound when pressure of the gas is doubled and its temperature is raised to 200°C ?(7+3)

8. a) Derive the sabine's formula for reverberation time.

     b) A 4m long String of mass per unit length 0.75×10^{-3} kg/m is tied at one end. A tension of 20 Newton is applied at another end. What will be the velocity of transverse waves along the string.   (7+3)

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