



188202618803

MRD-12<sup>th</sup> (PHY-1-2026)**PHYSICS (Part-II)**

Total Time: 3:00 Hours

Total Marks: 85

(Full Course)

Note: There are three sections in this paper i.e. A, B &amp; C.

VERSION: **B**

Time Allowed: 20 Minutes

**"Section-A"**

Choose the correct option i.e. A, B, C, or D.

- When a surface is placed parallel to the direction of electric field, the electric flux through the surface is:
  - Maximum
  - Zero
  - Positive
  - Negative
- If the length of a conductor is doubled and its cross sectional area is reduced to half, its resistance will:
  - Be doubled
  - Be halved
  - Be quadrupled
  - Remain constant
- The magnetic flux through coil is increased from 2 Wb to 10 Wb in 0.1 s. The induced e.m.f across the coil is:
  - 10V
  - 20V
  - 30V
  - 40V
- If the frequency of A.C source in a purely inductive circuit is doubled, the current in the circuit will:
  - Increase
  - Decrease
  - Remain constant
  - Stop to flow
- If the distance of a point from a point charge is doubled, the electric field E at this point becomes:
  - E/2
  - E/4
  - E/8
  - 4E
- A material has a very high bulk modulus. This implies it is:
  - Compressible
  - Ductile
  - Incompressible
  - Malleable
- In a purely inductive A.C circuit, the phase difference between the applied voltage and current is:
  - 0°
  - 45°
  - 60°
  - 90°
- Kirchhoff's current law is a consequence of:
  - Mass
  - Energy
  - Momentum
  - Charge
- An electric field is directed towards north. A positive charge placed in the field will experience electric force towards:
  - East
  - West
  - North
  - South
- A 50cm long wire carrying 2A current placed perpendicular to a uniform magnetic field of 1T will experience magnetic force of:
  - 0.25N
  - 0.5N
  - 0.75N
  - 1N
- If the velocity is kept constant, the particles having the smallest de-Broglie wavelength among the following are:
  - Neutrons
  - Protons
  - Electron
  - Alpha particles
- The type of deformation in which strain is not zero even when the stress is zero is called:
  - Elastic deformation
  - Plastic deformation
  - Elastic limit
  - Ultimate tensile strength
- The shortest wavelength in the Lyman series of hydrogen spectrum corresponds to:
  - n=1
  - n=2
  - n=3
  - n=∞
- The materials which are weakly repelled by a strong magnet are called:
  - Diamagnetic
  - Paramagnetic
  - Ferromagnetic
  - Semiconductors
- If  $E_0$  is the ionization energy of a hydrogen atom, the energy of electron in the second excited state is:
  - $-E_0$
  - $-E_0/2$
  - $-E_0/4$
  - $-E_0/9$
- Reverse bias voltage across PN diode beyond which:
  - Breakdown occurs
  - Avalanche effect occurs
  - Forward current rises quickly
  - Diode burns out
- A radioactive substance has half-life of 8 days. If 20g is the original amount of substance, the substance left after 24 days will be:
  - 20g
  - 10g
  - 5g
  - 2.5g
- The angle at which the Compton shift in wavelength is maximum for the photons scattered from the target atoms is:
  - 0°
  - 45°
  - 90°
  - 180°



MRD-12<sup>th</sup> (PHY-1-2026)

Total Time: 2:40 mins

Total Marks: 67

**PHYSICS (Part-II)**

(Full Course)

Marks: 40

**"Section-B"**

Write short answers of any TEN (10) of the following parts. All parts carry equal marks.

- Q1. Why does the resistivity of a metallic conductor increase with rise in temperature and the resistivity of a semiconductor decreases with rise in temperature?
- Q2. Write any two differences between e.m.f and terminal potential difference of a cell under which the terminal voltage of a cell is (a) equal to its e.m.f (b) less than its e.m.f. State the condition for each case.
- Q3. The magnetic flux through a coil of 500 turns is decreased from  $5 \times 10^{-2}$  Wb to  $2 \times 10^{-2}$  Wb in 0.5s. Calculate the magnitude of the e.m.f induced in the coil.
- Q4. State Lenz's Law. How is this law consistent with the law of conservation of energy? Illustrate with an example of a bar magnet is moved towards or away from a coil?
- Q5. What are eddy currents and how do eddy currents produce a magnetic field? Give one application of eddy currents in moving trains?
- Q6. Differentiate between crystalline and amorphous substances. Give one property of each type of materials.
- Q7. Briefly explain why a pure semiconductor behaves as an insulator at low temperature and as a conductor at room temperature.
- Q8. Define the following terms.  
(i) P-types semiconductor (ii) N-type semiconductor (iii) Junction (iv) Amplification
- Q9. Calculate the wavelength of the second line in the Balmer series of hydrogen atom. ( $R_H = 1.0974 \times 10^7 \text{ m}^{-1}$ )
- Q10. Define the terms spontaneous emission, stimulated emission, population inversion and metastable state.
- Q11. Differentiate between nuclear fission and nuclear fusion. Give one example of each process.
- Q12. A radioactive sample has a half-life of 10 years. Calculate its decay constant.
- Q13. Define mass defect and binding energy. How does binding energy per nucleon decrease for heavy nuclei?

**"Section-C"**

Marks: 27

Answer any THREE (3) questions

- Q14 (a) Prove that the electric field due to an infinite sheet of charge at a point close to the sheet is given by  $E = \frac{\sigma}{2\epsilon_0}$  (05)  
(b) Calculate the electric field at a distance of 50cm from a point charge of magnitude  $100\mu\text{C}$ . (04)
- Q15 (a) Derive an expression for the magnetic field inside a current carrying solenoid, using Ampere's law. (05)  
(b) Define magnetic flux. For which orientation, the magnetic flux through a surface kept in a uniform magnetic field is (i) maximum (ii) minimum (iii) any value between maximum & minimum. Derive the appropriate formula. (04)
- Q16 (a) A sinusoidal alternating voltage is applied to a pure capacitor of capacitance C. Show that the average power dissipated in this AC circuit is zero. (05)  
(b) Define the following terms: (i) Phase of alternating quantity (ii) Phase difference between two alternating quantities (iii) Root mean square value of Alternating current (iv) Average value of alternating current (04)
- Q17 (a) Describe the photoelectric effect and explain the experimental results of photoelectric effect using photon theory given by Einstein to explain the experimental results of photoelectric effect. (05)  
(b) The wavelength of the x-rays incident on a carbon block is  $0.25\text{nm}$ . Calculate the energy of the x-ray photons ( $h = 6.63 \times 10^{-34}\text{Js}$ ) (04)