PHYSICS QUESTION PAPER

Time : 2 Hrs. **Max. Marks : 40**

Note :

(i) **All questions are compulsory.**
(ii) **Neat diagrams must be drawn wherever necessary.**
(iii) **Figures to the right indicate full marks.**
(iv) **Use of only logarithmic table is allowed.**
(v) **All symbols have their usual meanings unless otherwise stated.**
(vi) **Answer to every question must be written on a new page.**

Q. 1 Select and write the most appropriate answer from the given alternatives for each sub question. **[8]**

(i) Huygen's Wave Theory of Light could not explain ..... (1)
(a) reflection (b) refraction (c) interference (d) photoelectric effect.

(ii) In interference of light, a point is bright if the path difference between the two beams arriving at that point is ..... (1)
(a) an integral multiple of the wavelength
(b) an odd multiple of the wavelength
(c) an odd multiple of half of the wavelength
(d) an even multiple of the wavelength.

(iii) A bar magnet of moment M is divided into two equal parts by cutting it perpendicular to its length. The magnetic moment of each piece will be ..... (1)
(a) Zero (b) $\frac{M}{2}$ (c) M (d) 2 M.

(iv) Henry is equivalent to ..... (1)
(a) ampere/ second (b) ampere second
(c) Ohm/second (d) Ohm second.

(v) A pure semiconductor is known as ..... (1)
(a) extrinsic semiconductor (b) intrinsic semiconductor
(c) p-type semiconductor (d) n - type semiconductor

(vi) If μ_1 and μ_2 are refractive indices of the material of core and leading respectively of an optical fibre, then the loss of light due to its leakage can be minimized by making .....
(a) $\mu_1 > \mu_2$ (b) $\mu_1 < \mu_2$ (c) $\mu_1 \leq \mu_2$ (d) $\mu_1 = \mu_2$

(vii) The de-Broglie wavelength of 1 mg grain of sand blown by a wind at the speed of 20m/s is ..... [h = 6.63 × 10^{-34} S. I. unit] (1)
(a) 33.15 × 10^{-36} m (b) 33.15 × 10^{-33} m
(c) 33.15 × 10^{-30} m (d) 33.15 × 10^{30} m

(viii) Speed of an electron passing undeviated through a region of cross electric and magnetic fields of magnitude 4 × 10^5 V/m, and 0.02 Wb/m^2 respectively in meter per second is .....
(a) 2 × 10^6 (b) 8 × 10^6 (c) 2 × 10^7 (d) 8 × 10^7

Q. 2 (A) Attempt any One : **[8]**

(i) Find the energy of an electron in Second Bohr Orbit of hydrogen atom.
[Energy of an electron in the First Bohr Orbit = – 13.6 V] (2)

(ii) A parallel plate air condenser has an area 2 × 10^{-4} m^2 and separation between the two plates is 1 mm. Find its capacity. [ϵ_0 = 8.85 × 10^{-12} C^2 /Nm^2] (2)

(B) Attempt any Two :

(i) Describe how potentiometer is used to compare the e.m.f. of two cells by Sum and Difference Method. (3)

(ii) Derive an expression for the magnetic induction due to a short magnetic dipole at any point. (3)

(iii) What is a Communication Satellite ? Give any two advantages of Optical Communication over Conventional Communication. (3)

Q. 3 (A) Attempt any One : **[8]**

(i) State the conditions necessary for obtaining sharp and steady interference pattern. (2)

(ii) Draw the logical symbol of NAND gate and give truth table of NAND gate. (2)

(B) **Attempt any Two :**

(i) What is thermocouple ? Explain Seebeck effect. (3)

(ii) Distinguish between Laser and Maser. (Any three points) (3)

(iii) State Einstein's photoelectric equation. Explain two characteristics of photoelectric effect on the basis of Einstein's photoelectric equation. (3)

Q.4 (A) Attempt any Two : [8]

(i) What are eddy currents ? State any two applications of eddy currents. (2)

(ii) Draw a neat labelled circuit diagram of a transistor used as common emitter amplifier. (2)

(iii) Explain how a moving coil galvanometer can be converted into voltmeter. (2)

(B) **Attempt any One :**

(i) What is interference of Light ?
With the help of neat ray diagrams, describe how the distance between two virtual in biprism experiment is measured. (4)

(ii) State and prove Gauss' Theorem in Electrostatics. (4)

Q.5 Attempt any Two : [8]

(i) An LCR series combination has R = 10 Ω, L = 1 m H and C = 2 μF. Determine : (a) the resonant frequency, (b) The current in the circuit and (c) Voltages across L and C, when an altering voltage of 10 mV, operating at the resonant frequency is applied to the series combination. (4)

(ii) Determine the change in wavelength of light during its passage from air to glass, if the refractive index of glass with respect to air is 1.5 and the frequency of the light is 4×10^{14} Hz.
Find the wave number of light in glass. [Velocity of light in air = 3×10^8 m/s] (4)

(iii) A coil of tangent galvanometer having diameter 16 cm is set up in magnetic meridian. When current of 0.8A is passed through the coil, the magnetic needle is deflected through 45°. Find the length of the wire in the coil.
Also find the reduction factor of tangent galvanometer.
[BH = 2×10^{-5} Wb/m^2, $\mu_0 = 4\pi \times 10^{-7}$ Wb/Am.] (4)