Subject - PHYSICS	Marks - 50
Date - 22-10-2024	Time - 9 a.m. to 11.30 a.m.

Note :
1) All sections are compulsory.
2) All symbols have their ususal meaning unless and otherwise stated.
3) Figures to the right indicate full marks.
4) Draw the diagrams wherever neccessary.
5) Use of logtable is allowed. Calculater is not allowed.
6) For each MCQ, correct answer must be written along with its alphabet. Only the first attempt will be considered for evaluation

SECTION - A

Q.1 Select and write the most appropriate answer from the given alternatives for each subquestion. **(7)**

i) When the angular acceleration of a stationary body is zero, then .... will be equal to zero.
   (a) Angular momentum
   (b) Moment of inertia
   (c) Torque
   (d) Radius of gyration

ii) Instrument which can measure terminal potential difference as well as electro motive force (e.m.f.) is ....
   (a) Wheatstone's meterbridge
   (b) Voltmeter
   (c) Potentiometer
   (d) Galvanometer

iii) If the current in a circular coil is clockwise, the pole produced on its front face will be ....
   (a) N-Pole
   (b) S-pole
   (c) Either N-pole or S-pole
   (d) Neither N-pole or S-pole

iv) Bohr Magneton is ....
   (a) magnetic induction of electron when it is revolving in the first Bohr orbit
   (b) magnetic moment of electron when revolving in the first Bohr orbit.
   (c) angular momentum of electron when revolving in the first Bohr orbit.
   (d) angular momentum of electron when revolving in last Bohr Orbit.

v) The radius of the 4th orbit of the electron will be smaller than its 8th orbit by a factor of ....
   (a) 2   (b) 4   (c) 8   (d) 16

vi) In simple harmonic motion, acceleration of the particle is zero, when its ....
   (a) velocity is zero.
   (b) displacement is zero.
   (c) both velocity and displacement are zero.
   (d) both velocity and displacement are maximum

vii) The distance between two successive nodes in a stationary wave of wavelength λ is ....
   (a) λ (b) $\lambda/2$ (c) $\lambda/4$ (d) 2λ

Q.2   Answer the following.   (7)

  i)   What is end correation ?

  ii)   Write Cyclotron formula.

  iii) State one use of electromagnet.

  iv)   For Hydrogen atom, what is the value of energy of electron in ground state ?

  v)   Draw the symbol for Exclusive OR gate.

  vi)   In a common base connection a certain transistor has an emitter current of 10mA
        & collector current of 9.8 mA. Calculate the value of base current.

  vii) A wire of linear density 1.96×10^{-3} kg/m is stretched by 2kg wt. Find the velocity
        of transverse wave along the wire.

SECTION - B

Attempt any eight.   (16)

Q.3   Show that bob of simple pendulum performs linear simple harmonic motion.

Q.4   State first and second laws of vibrating string.

Q.5   Draw a neat labelled diagram of meterbirdge to determine unknown resistance.

Q.6   In case of toroid show that magnetic field (B) is inversely proportional to radius (R)
       of toroid.

Q.7   Define : a) curie temperature   b) Magnetization

Q.8   Define half life of radioactive material and state its formula.

Q.9   Write any two application of Zener diode.

Q.10   The common base DC current gain of a transistor is 0.967. If the emitter current is
       10 mA. What is the value of base current ?

Q.11   A ballet dancer spins about a vertical axis at 90 rotations per minute with arms
       outstretched. With the arms folded, the moment of inertia about the same axis of
       rotation changes to 75%. Calculate the new rotation per minute. (New frequency)

Q.12   If a particle of mass 50 g executes S.H.M. along a path length of 20 cm at the rate of
       600 osciliations per minute. Find its total energy.

Q.13   An air column is of length 17 cm long. Calculate the frequency of 5th overtone if the
       air column is closed at one end.

SECTION - C

Attempt any four.   [12]

Q. 14 Show that, the magnetic field at a point P at a perpendicular distance R from the
       infinitely straight wire is $B = \dfrac{\mu_o I}{2\pi R}$

Q. 15 Explain Ferromagnetism on the basis of Domain theory.

Q. 16 State three postulate of Bohr's atomic model.

Q. 17 Resistance in Wheatstone's bridge are 30Ω , 60Ω, 15Ω and a series combination of
       5 Ω and X. If the bridge is balanced, calculate value of X.

Q. 18 Thin uniform rod of mass 3 kg and length 2m starts from rest and rotates about an axis passing through its centre and perpendicular to its length with a speed of 900 rotation per minute for 10 second. Find torque acting on it.

Q. 19. A simple pendulum performs SHM of period 4 second. How much time after crossing the mean position will the displacement of the bob be one third of its amplitude ?

SECTION - D

Attempt any two.   [8]

Q. 20 Define potential gradient of potentiometer. Derive an expression for internal resistance (r) of a cell using neat labelled circuit diagram.

Q. 21 i)   Derive an expression for maximum speed of a vehicle moving along a horizontal circular track.

    ii)   The equation of a transverse wave along a stretched string is given by,

$$y = 2 \sin 2\pi\left(\frac{t}{0.02} - \frac{x}{40}\right)$$ where the length is expressed in cm and time

in second. Calculate the wavelength and velocity of the wave.

Q. 22 i)   State the equation for
a) magnetic field produced by a current in a circular arc of a wire.
b) magnetic field at the centre of a full circle of a wire, carrying current I.

    ii)   An iron rod is placed parallel to magnetic field of intensity 2000 A/m. The magnetic flux through the rod is 6×10^{-4} wb and its cross-sectional area 3 cm^2. What is magnetic permeability of rod in Wb/A-m?

Q. 23 i)   Write any two application of photodiode.

    ii)   A difference of 2.3 eV separates two energy levels in an atom. What is the frequency of radiation emitted when the atom makes a transition from upper level to the lower level ? (Given : $h = 6.63 \times 10^{-34}$ Js)

❖ ❖ ❖