2017
PHYSICS

Total marks : 70   Time : 3 hours

General instructions:
i)   *Approximately 15 minutes is allotted to read the question paper and revise the answers.*
ii)   *The question paper consists of 30 questions. All questions are compulsory.*
iii) *Marks are indicated against each question.*
iv)   *Internal choice has been provided in some questions.*

N.B: Check that all pages of the question paper is complete as indicated on the top left side.

1. The resistance of a conductor increases with   **1**
    (a) increase in length
    (b) increase in temperature
    (c) decrease in cross-sectional area
    (d) all of these.

2. A magnetic field can be produced by   **1**
    (a) a moving charge   (b) a changing electric field
    (c) none of these   (d) both of these.

3. A person can not see objects clearly beyond 2.0 m. The power of lens
    required to correct his vision will be   **1**
    (a) $+2.0\,D$ (b) $-1.0D$ (c) $+1.0D$ (d) $-0.5D$

4. Solar energy is mainly caused due to   **1**
    (a) fission of uranium present in the sun
    (b) fusion of protons during synthesis of heavier elements
    (c) gravitational contraction
    (d) burning of hydrogen in oxygen.

5. The device that can act as a complete electronic circuit is   **1**
    (a) junction transistor
    (b) zener diode
    (c) junction diode
    (d) integrated circuit.

6. Define the term electrical resistivity of a material. **1**

7. Microwaves are used in radar. Why? **1**

8. The refractive index of a certain glass is 1.5 for light whose wavelength is 6000nm in vacuum. Calculate the wavelength of this light when it passes through the given glass. **1**

9. How many electron volts make one joule of energy? **1**

10. Give the logic symbol of NAND gate. **1**

11. A straight wire of 1.4 m long carries a current of 7A at right angles to a uniform magnetic field of 0.01T. Calculate the mechanical force acting on the wire due to the magnetic field. **2**

12. **a.** A wire of length l is bent in the form of a square and carries a current I. What is the value of its magnetic moment?

    Or **2**

    b. Name any two factors on which the current sensitivity of galvanometer depends.

13. **a.** What are Eddy currents? How are these produced?

    Or **2**

    b. How can the Q-factor of a resonant circuit be increased?

14. What are electromagnetic waves? Write the equations for associated electric and magnetic fields. **2**

15. **a.** A 2.0 cm object is placed at 15cm in front of a concave mirror of focal length 10cm. Find the position, size and nature of the image.

    Or **2**

    b. For a crown glass prism of angle A=5°, the refractive indices for blue and red coloured rays are 1.523 and 1.513 respectively. Find the angular dispersion and dispersive power of prism material.

16. State two factors by which the range of TV signals can be increased. **2**

17.   **a.**   Derive an expression for the torque experienced by an electric dipole kept in a uniform electric field.

                                              Or   **3**

      b.   Obtain an expression for the electrostatic potential energy of a system of two point charges.

18.   With a help of circuit diagram, obtain an expression for unknown resistance of a metallic conductor using a meter bridge.   **3**

19.   **a.**   A metallic wire of length l and resistance 5Ω is stretched to double its length. Find its new resistivity and new resistance. Assume that there is no change in the density on stretching.

                                              Or   **3**

      b.   A battery of e.m.f 10V and internal resistance 3Ω is connected to a resistor R. If the current in the circuit is 0.5A. Calculate the value of R. What is the terminal voltage of the battery when the circuit is closed?

20.   With the help of a schematic diagram, explain the principle and working of a cyclotron.   **3**

21.   Derive an expression of the mutual conductance for a pair of long co-axial solenoids.   **3**

22.   With a labelled ray diagram, explain the working principle of a compound microscope.   **3**

23.   **a.**   Derive an expression for the de-broglie wavelength associated with an electron accelerated from rest through a potential difference v.

                                              Or   **3**

      b.   Derive Einstein's photoelectric equation.

24.   **a.**   Obtain an expression for the total energy of an electron in n^{th} Bohr orbit.

                                              Or   **3**

      b.   Explain the different spectral series in a hydrogen spectrum.

25.   Deduce the relation $N = N_o e^{-\lambda t}$, where symbols have their usual meaning.   **3**

26.   Using Phasor diagram, derive an expression for impedance of an A.C circuit
      containing L,C and R joined in series.   **3**

27.   With the help of a block diagram of a detector for an amplitude modulated
      signal, explain the function of each components.   **3**

28.   **a.** Define electric potential at a point. Obtain an expression for the electrostatic
          potential due to an electric dipole.
                                      Or   **5**
      b. Define capacitance of a capacitor. Obtain an expression for the capacitance
          of a parallel plate capacitor and hence explain the effect of a dielectric on
          its capacitance.

29.   **a.** What is a converging lens? Derive an expression for the lens maker's
          formula for a convex lens.
                                      Or   **5**
      b. Define angle of minimum deviation. Obtain an expression for the refractive
          index of the material of the prism and angle of minimum deviation.

30.   **a**. What is a rectifier? Explain with circuit diagram the working principle
          and output – input wave formation of a full wave rectifier.
                                      Or   **5**
       b. What is an amplifier? Explain with a circuit diagram the working of an
          n-p-n transistor as a common emitter amplifier.

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