

Note- (i) All questions are compulsory. Internal options are given in each question from question Nos. 5 to 18. (ii) Each question from Question Nos. 1 to 4 carry 5 marks and each sub-question carries 1 mark. (iii) Each question from Question Nos. 5 to 8 carry 2 marks and word limit for each answer is approx. 30 words. (iv) Each question from Questions Nos. 9 to 13 carry 4 marks and word limit for each answer is approx. 75 words. (v) Each question from Question Nos. 14 to 16 carry 5 marks and word limit for each answer is approx. 120 words. (vi) Each question from Questions Nos. 17 and 18 carry 6 marks and word limit for each answer is approx. 150 words. (v) Draw neat and labelled diagrams wherever necessary.

1. Select and write the correct option from the options given in each question :

(i) The angle between electric lines of force and equipotential surface is :

- | | |
|----------------|-----------------|
| (a) 0° | (b) 180° |
| (c) 90° | (d) 45° |

(ii) The conductivity of superconductor is :

- | | |
|----------------|---------------|
| (a) Infinity | (b) Very less |
| (c) Very large | (d) Zero |

(iii) The Magnetic effect of current was discovered by :

- | | |
|-------------|-------------|
| (a) Fleming | (b) Oersted |
| (c) Faraday | (d) Ampere |

(iv) Eddy currents are used in :

- (a) electrolysis
- (b) making a galvanometer dead beat
- (c) electroplating
- (d) to increase the sensitivity of galvanometer

(v) The formula for the velocity of electromagnetic waves in vacuum is given by :

- | | |
|---|---|
| (a) $c = \sqrt{\mu_0 \epsilon_0}$ | (b) $c = 1/\sqrt{\mu_0 \epsilon_0}$ |
| (c) $c = \sqrt{\frac{\mu_0}{\epsilon_0}}$ | (d) $c = \sqrt{\frac{\epsilon_0}{\mu_0}}$ |

2. Fill in the blanks :
- Meter bridge works on the principle of
 - In a parallel plate capacitor with increase in distance between the plates, its capacity
 - An air bubble inside water behaves like a lens.
 - Zener diode is used as
 - For healthy eye least distance of distinct vision is
3. Select the appropriate option from column 'B' for each statement of column 'A' and match the correct pair :
- | Column 'A' | Column 'B' |
|----------------------------|--|
| (a) Brewster law | (i) Modulator and demodulator |
| (b) Quantization of charge | (ii) Refraction of light |
| (c) Snell's law | (iii) Undamped oscillation of high frequency |
| (d) Modem | (iv) Polarization of light |
| (e) Oscillator | (v) $Q = \pm ne$ |
4. Give answer in one sentence each :
- How can a galvanometer be converted into voltmeter?
 - Write the use of Fax Machine.
 - How are N-type of semiconductors prepared?
 - What is the value of specific charge of an electron?
 - The mass of a moving particle is m and velocity is v , then write the formula for de-Broglie wavelength λ .
5. What is greenhouse effect? Explain.
- (Or) Which waves are used as signal through fog and why?
6. When an object is kept in between optical centre and focus in front of convex lens, draw ray-diagram of image formation.
- (Or) Write any two differences between regular and irregular (diffused) reflection.
7. Define the following:
- Threshold frequency and work function.
- (Or) The work function of a metal is 0.1 eV. Calculate the threshold frequency for photo-electric emission.
8. Write the meaning of laser and two uses.
- (Or) Write any two advantages of optical communication.
9. Prove that:
- $$I^2 = H^2 + V^2 \text{ and } \tan\theta = \frac{V}{H}, \text{ where for terrestrial magnetism } \theta \text{ angle of dip, } H \text{ horizontal component and } V \text{ vertical component.}$$
- (Or) State Biot-Savart's law. Define unit of current.

10. Prove that for A.C. circuit :

$$P_{av} = V_{r.m.s.} \times I_{r.m.s.} \cos\theta.$$
- (Or) Write the causes of energy loss and ways to reduce them in transformer (any four).
11. Write down four differences between interference and diffraction.
- (Or) Establish relation $d = \sqrt{2hR}$ between height h of the TV antenna and distance d upto which TV signal can be transmitted, where R = Radius of earth.
12. Describe the astronomical telescope on the basis of the following points :
- Labelled Ray diagram
 - Derivation of formula for magnifying power, when final image is formed at the least distance of distinct vision.
- (Or) Describe the compound microscope on the following headings :
- Labelled Ray diagram of formation of image
 - Magnifying power when final image is formed at least distance of distinct vision.
13. Differentiate between amplitude modulation and frequency modulation (any four).
- (Or) What are analog and digital signals? Explain with diagrams.
14. Prove that potential at point on transverse (equatorial) position of electric dipole is zero.
- (Or) Establish the formula for the capacity of spherical capacitor.
15. What is d.c. motor? Explain its construction and working with the help of labelled diagram.
- (Or) A resistance and inductance are connected in series with a source of alternating e.m.f. Derive an expression for resultant voltage, impedance and phase difference between current and voltage in alternating circuit.
16. Explain the use of P-N junction diode as full wave rectifier on the basis of the following points.
- Labelled circuit diagram
 - Working method
 - Graph between input and output potential with the variation of time.

(Or) Write down 5 differences between N-type and P-type semiconductors.

17. Describe the experiment to compare the e.m.f. of two cells using potentiometer under the following points :

- | | |
|---------------------------------------|----------------------------|
| (i) Labelled electric circuit diagram | (ii) Derivation of formula |
| (ii) Observation table | (iv) Two precautions. |

(Or) A Leclanche cell gets balanced on the wire of potentiometer at 280 cm. If a Daniel cell is joined in series with Leclanche cell, then the balance point is obtained at 480 cm. Compare the e.m.f. of two cells.

18. Establish Lens maker's formula :

$$\frac{1}{f} = (\mu - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

(Or) Define deviation without dispersion. Derive an expression for its essential condition and resultant deviation.