





TIME : 3.00 HOURS

MAX MARKS : 70

**PART-I**

15 x 1 = 15

**Note :** (i) Answer all the questions. (ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

- The physical quantity which has the S.I unit of  $V\ m$  is  
 (a) Electric field (b) Electric potential (c) Electric flux (d) Electric dipole moment
- Which charge configuration produces a uniform electric field?  
 (a) point charge (b) uniformly charged infinite line  
 (c) uniformly charged infinite plane (d) uniformly charged spherical shell
- The temperature coefficient of resistance of a wire is  $0.00125$  per  $^{\circ}C$ . At  $20^{\circ}C$ , its resistance is  $1\ \Omega$ . The resistance of the wire will be  $2\ \Omega$  at  
 (a)  $820^{\circ}C$  (b)  $700^{\circ}C$  (c)  $800^{\circ}C$  (d)  $850^{\circ}C$
- A non-conducting charged ring carrying a charge of  $q$ , mass  $m$  and radius  $r$  is rotated about its axis with constant angular speed  $\omega$ . Find the ratio of its magnetic moment with angular momentum is  
 (a)  $\frac{q}{m}$  (b)  $\frac{q}{2m}$  (c)  $\frac{2q}{m}$  (d)  $\frac{q}{4m}$
- In a series RL circuit, the resistance and inductive reactance are the same. Then the phase difference between the voltage and current in the circuit is  
 (a)  $0^{\circ}$  (b)  $30^{\circ}$  (c)  $45^{\circ}$  (d)  $90^{\circ}$
- Which of the following is true for electromagnetic waves?  
 (a) it transports energy (b) it transports momentum  
 (c) it transports angular momentum (d) All the above
- Stars twinkle due to,  
 (a) refraction (b) total internal reflection (c) reflection (d) polarization
- First diffraction due to single slit width is  $1\ X\ 10^{-5}$  at  $30^{\circ}$  cm. Then wavelength of light used is  
 (a)  $500\ \text{\AA}$  (b)  $600\ \text{\AA}$  (c)  $700\ \text{\AA}$  (d)  $800\ \text{\AA}$
- Emission of electrons by the absorption of heat energy is called ..... emission.  
 (a) photoelectric (b) field (c) thermionic (d) secondary
- In a hydrogen atom, the electron revolving in the 8th orbit, has angular momentum equal to  
 (a)  $h$  (b)  $\frac{h}{\pi}$  (c)  $\frac{4h}{\pi}$  (d)  $\frac{2h}{\pi}$
- The barrier potential of a silicon diode is approximately,  
 (a)  $0.3\ V$  (b)  $0.7\ eV$  (c)  $1.1\ V$  (d)  $0.7\ V$
- The particle which gives mass to protons and neutrons are  
 (a) Higgs particle (b) Einstein particle (c) Nanoparticle (d) Bulk particle
- Which one is reverse biased ?  
 (a)  $15V$  —  —  $10V$  (b)  $-5V$  —  —  $-10V$   
 (c)  $-10V$  —  —  $0V$  (d)  $10V$  —  —  $-5V$



14. de Broglie wavelength associated with an electron is

(a)  $\frac{12.72}{v} \text{ \AA}^0$

(b)  $\frac{12.72}{\sqrt{v}} \text{ \AA}^0$

(c)  $\frac{12.27}{\sqrt{v}} \text{ m}$

(d)  $\frac{12.27}{\sqrt{v}} \text{ \AA}^0$

15. If the focal length of a lens is 100 cm then its power is

(a) 0.5 D

(b) 1 D

(c) 1.5 D

(d) 2 D

**PART – II**

(6 x 2 = 12)

(i) Answer any six of the following questions. (ii) Question No. 17 is Compulsory.

16. State conservation of electric charges.

17. Find the heat energy produced in a resistance of  $10 \Omega$  when 5 A current flows through it for 5 minutes

18. State Lenz's law.

19. What is displacement current?

20. Why do clouds appear white?

21. Write any two applications of photo cells.

22. Define impact factor.

23. Prove that  $A(\vec{A} + \vec{B}) = AB$

24. Write a note on black holes.

**PART– III**

(6 x 3 = 18)

(i) Answer any six of the following questions. (ii) Question No. 31 is Compulsory.

25. Write down the properties of electric field lines.

26. How is galvanometer converted into an ammeter and a voltmeter ?

27. State the following (i) Ohm's law (ii) Junction rule (iii) loop rule

28. State and explain Brewster's law.

29. Derive the Duane – Hunt formula for continuous X-rays.

30. Explain the variation of average Binding energy with mass number using graph

31. The angle of minimum deviation for an equilateral prism is  $30^\circ$ . Find the refractive index of the material of the prism.

32. An inductor of inductance L carries an electric current i. How much energy is stored while establishing the current in it?

33. Differentiate Zener breakdown and Avalanche breakdown.

**PART – IV**

(5 x 5 = 25)

Answer all the questions.

34. (A) Explain in detail the construction and working of Van de Graff generator (OR)

(B) Obtain the equation for radius of illumination.

35. (A) Explain the determination of the internal resistance of a cell using potentiometer (OR)

(B) Find out the phase relationship between voltage and current in AC circuit has only a capacitor.

36. (A) State and explain Radioactive law of disintegration (OR)

(B) State Ampere's circuital law. Obtain an expression for magnetic field due to the current carrying wire of infinite length using Ampere's circuital law.

37. (A) State and prove De Morgan's theorem. (OR)

(B) Calculate the electric field due to a dipole on its equatorial line.

38. (A) What is absorption spectra? Explain their types. (OR)

(B) (i) Write any three uses of X-ray. (3 mark)

(ii) Calculate the cut-off wavelength of X-rays from an x ray tube of accelerating potential 20000 V. (2 mark)