COURSE NAME: 12TH **Marks : 100** **Topic : FULL SYLLABUS** **DATE :**

PART– A

Instructions:

*(1) There are 50 objective type **(M.C.Q)** questions in **part-A** and all questions are compulsory.*

(2) The questions are serially numbered from 1 to 50 and each carries 1 mark.

(3) Read each question carefully, select proper alternative and answer in the O.M.R. sheet.

(4) The OMR sheet is given for answering the questions. The answer of each question is represented by (1) O, (2) O, (3) O, (4)O. Darken the circle of the correct answer with ball-pen.

(5) Rough work is to be done in the space provided for this purpose in the test booklet only.

(6) Set No. of question paper printed on the upper-most right side of the Question paper is to be written in the column provided in the OMR sheet.

(7) Students may use a calculator and log-table, if necessary.

---

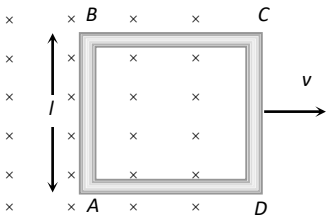
1. An equiconvex lens of refractive index μ and radius of curvature R has its one surface silvered. A point source O is placed before the silvered lens so that is image is coincident with it, the distance of the object from the lens is:

(1) $\frac{R}{(\mu-1)}$ (2) $\frac{2R}{(\mu-1)}$ (3) $\frac{R}{(2\mu-1)}$ (4) $\frac{2R}{(2\mu-1)}$

2. The process of adding impurities in a semi-conductor is known as _____.

(1) Accepting (2) Donating (3) Doping (4) Mixing

3. A conducting square loop of side l and resistance R moves in its plane with a uniform velocity v perpendicular to one of its sides. A magnetic induction B constant in time and space, pointing perpendicular and into the plane at the loop exists everywhere with half the loop outside the field, as shown in figure. The induced e.m.f. is



(1) Zero (2) RvB (3) VBl/R (4) VBl

4. When the current change from + 2A to – 2A in 0.05 second, an e.m.f. of 8 V is induced in a coil. The coefficient of self-induction of the coil is

(1) 0.1 H (2)0.2 H (3) 0.4 H (4)0.8 H

5. In a L-R circuit, the value of L is $\left(\frac{0.4}{\pi}\right) henry$ and the value of R is 30 ohm. If in the circuit, an alternating e.m.f. of 200 volt at 50 cycles per sec is connected, the impedance of the circuit and current will be

(1) $11.4\Omega, 17.5\,A$ (2) $30.7\,\Omega, 6.5A$ (3) $40.4\Omega, 5\,A$ (4) $50\,\Omega, 4A$

6. For detecting the light

(1) The photodide has to be reverse biased.

(2) The photodide has to be forward biased.

(3) The LED has to be connected in forward biased.

(4) The LED has to be connected in reverse biased.

7. In a diode reverse bias voltage is 2V and width of the depletion region is 200A°. Then electric field intensity = _____ $\frac{V}{cm}$.

(1) 10^{-5} (2) 10^{6} (3) 10^{8} (4) 10^{7}

8. The flux linked per each turn of a coil of N turns charges from ϕ_1, to ϕ_2. If the total resistant of the circuit including the coil is R, the induced charge in the coil is _____.

(1) $\frac{N(\phi_2 - \phi_1)}{R}$ (2) $\frac{N(\phi_2 - \phi_1)}{t}$

(3) $\frac{N(\phi_2 - \phi_1)}{Rt}$ (4) $N(\phi_2 - \phi_1)$

9. When the solenoid is wound over a soft iron core if relative permeability μr, then the self inductance of solenoid is L = _____.

(1) $\mu_0 n^2 lA$ (2) $\mu_0 N^2 A$ (3) $\mu_r \mu_0 n^2 lA$ (4) $\mu_r \mu_0 n^2 A$

10. Which gate is represented by this symbol?

(1) AND (2) OR (3) NOT (4) NAND

11. When will the conductivity of a GeSemi conductor decrease?

(1) On adding donor impurity (2) On adding acceptor impurity

(3) On decreasing the temperature (4) On marking UV light incident

12. Photon and electron are given same energy $(10^{-20}\,J)$ Wavelength associated with photon and electron are λ_{Ph} and λ_{el} then correct statement will be

(1) $\lambda_{Ph} > \lambda_{el}$ (2) $\lambda_{Ph} < \lambda_{el}$ (3) $\lambda_{Ph} = \lambda_{el}$ (4) $\frac{\lambda_{el}}{\lambda_{Ph}} = C$

13. The dimensional formula of Rydberg's constant is _____.

(1) $M^1 L^1 T^0$ (2) $M^1 L^{-1} T^0$ (3) $M^0 L^1 T^0$ (4) $M^0 L^{-1} T^0$

14. Which spectral series appears in ultra-violet region?

(1) Lyman series (2) Balmer series (3) Paschen series (4) Pfund series

15. Which physical quantity has unit Fermi?

(1) Energy (2) length (3) Mass (4) Time

16. Which of the following quantities has unit joule second?

(1) Power (2) Work (3) Angular Momentum (4) Linear Momentum

17. What are the values of a and b respectively in the reaction? ${}^{9}_{4}Be + {}^{4}_{2}He \rightarrow {}^{a}_{b}X + {}^{1}_{0}n$

(1) 12, 6 (2) 7, 14 (3) 14, 7 (4) 6, 12

18. When the electron in the hydrogen atom jumps from 2nd orbit to 1st orbit, the wavelength of radiation emitted is λ. When the electrons jump from 3rd orbit to 1st orbit, the wavelength of emitted radiation would be

(1) $\frac{27}{32}\lambda$ (2) $\frac{32}{27}\lambda$ (3) $\frac{2}{3}\lambda$ (4) $\frac{3}{2}\lambda$

19. The unit of $\frac{\Delta\phi}{\Delta t}$ is ____.

(1) Volt (2) ohm (3) weber (4) amper

20. What is the r.m.s. value of the current for A.c. circuit I = 200 cos (200 t + 45°) A?

(1) $50\sqrt{2}A$ (2) 100 A (3) 100 $\sqrt{2}A$ (4) zero

21. In A.C. circuit with only inductor the phase different between current and Voltage?

(1) zero (2) $-\frac{\pi}{2}$ (3) $\frac{\pi}{2}$ (4) π

22. For step down transform value of transformation ratio is _____.

(1) r> 1 (2) r < 1 (3) r = 1 (4) r = 0

23. The magnetic flux linked with a coil is changing with time t (second) according to $\phi=5t^2 - 4t + 2$; where ϕ is in Wb. At t = 0.5 second the induced emf in the coil is _____.

(1) 1 Volt (2) 0.1 Volt (3) 0.1 m volt (4) 10 Volt

24. The binding energy per nucleon of O^{16} is 7.97 MeV and that of O^{17} is 7.75 MeV. The energy (in MeV) required to remove a neutron from O^{17} is

(1) 3.52 (2)3.64 (3) 4.23 (4) 7.86

25. If wavelength of a wave is 6000 Å. Then wave number will be _____m^{-1}.

(1) 1.66×10^7 (2) 1.66×10^6 (3) 1.66×10^{-1} (4) 1.66×10^3

26. What should be the resistance of an ideal ammeter?

(1)very less (2) very high (3) infinite (4) zero

27. Kirchoff's both laws are representations of conservation laws of _____.

(1)charge& energy (2) momentum & energy

(3)charge& momentum (4) momentum, charge & energy

28. Ampere's law is the integral form of _____.

(1)Biot - Savart's law (2)Colulomb's law (3) Gauss's law (4) Maxwell's law

29. What is the dimensional formula of polarisability in terms of Q?

(1) $M^{-1}L^0T^2Q^{-2}$ (2) $M^{-1}L^0T^2Q^2$ (3) $M^1L^1T^{-2}Q^2$ (4) $M^0L^0T^0Q^2$

30. To convert Galvanometer into Voltmeter _____ is to be connected.

(1) a small R in parallel with it. (2) a high R in series with it.

(3) a small R in series with it. (4) a high R in Parallel with it.

31. The time of vibration of a magnetic needle vibrating in the vertical plane is 3 s. When magnetic needle is made to vibrate in the horizontal plane, the time of vibration is $3\sqrt{2}$. Then the angle of dip is

(1) 30° (2) 45° (3*) 60° (4) 90°

32. Relative permeability of a substance is 0.075. Its magnetic susceptibility is _____.

(1) 1.075 (2) -0.925 (3) 0.925 (4) -1.075

33. If the critical angle for total internal reflection from a medium to vacuum is 30°, the velocity of light in the medium is

(1) 3×10^8 *m/s* (2*) 1.5×10^8 *m/s*

(3) 6×10^8 *m/s* (4) $\sqrt{3}\times10^8$ *m/s*

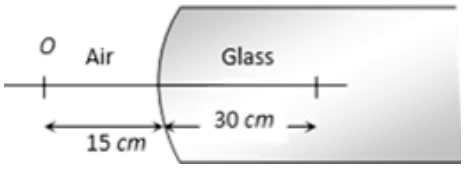
34. Rest mass of photon is _____.

(1) $\frac{hc}{\lambda}$ (2) $\frac{hf}{c^2}$ (3) $\frac{hf}{C}$ (4) zero

35. Atomic mass number of an element thorium is 232 and its atomic number is 90. The end product of this radioactive element is an isotope of lead (atomic mass 208 and atomic number 82). The number of alpha and beta particles emitted is:

(1)α = 3, β = 3 (2)α = 6, β = 4 (3)α = 6, β = 0 (4)α = 4, β = 6

36. A point object O is placed in front of a glass rod having spherical end of radius of curvature 30 cm. The image would be formed at



(1) 30 cm left (2)Infinity (3) 1 cm to the right (4)18 cm to the left

37. In Young's double slit experiment how many maximas can be obtained on a screen (including the central maximum) on both sides of the central fringe if $\lambda = 2000\ \mathring{A}$ and $d = 7000\ \mathring{A}$

(1) 12 (2*) 7 (3) 18 (4) 4

38. S.I. unit of permittivity [E_0] _____.

(1) $C^2\ N^{-1}\ M^{-2}$ (2) $N^1M^2C^{-1}$ (3) $N^1M^2C^{-2}$ (4) $A^1M^{-1}C^0$

39. A wire is uniformly stretched to make its length double. What will be its new resistance?

(1) 2 times (2) $\frac{1}{2}$ times (3) $\frac{1}{4}$ times (4) 4 times

40. Two spheres of different radii are given equal amount of charge. The electric potential will be _____.

(1) Equal on surface of both spheres. (2) More on the surface of large sphere.

(3) More on the surface of smaller sphere (4) Dependent on the mass of spheres.

41. Two capacitors of 1μf are connected in parallel with battery of 100 V. How much energy is stored inside it?

(1) 10^{-2}J (2) 10^4J (3) 10^2J (4) 10^{-4}J

42. Dimensional formula of intensity of electric field is _____.

(1) $M^1L^2T^{-3}A^{-1}$ (2) $M^1L^1T^{-3}A^{-1}$ (3) $M^1L^1T^{-2}A^{-1}$ (4) $M^1L^2T^{-3}A^{-2}$

43. A soap bubble is charged uniformly. Its radius will _____.

(1)increase (2) decrease (3) not change (4) none of these

44. A gate has the following truth table

P	1	1	0	0
Q	1	0	1	0
R	1	0	0	0

The gate is

(1)NOR (2)OR (3)NAND (4)AND

45. Potential energy of an electric dipole is minimum (Negatively maximum) when _____.

(1) the dipole is perpendicular to the field. (2) the dipole is parallel to the field.

(3) the dipole is anti-parallel to the field. (4) the dipole moment makes 60° with the field.

46. Current flowing from thick-wire to thin-wire. so current in thick-wire will _____.

(1) Remains same (2) decrease (3) increase (4) depends on material

47. Two cells of each 2V and internal resistance 1Ω are connected in series to a resistor R = 2Ω. maximum possible power consumed by the resistor =_____.

(1) $\frac{8}{9}W$ (2) 3.2 W (3) $\frac{16}{9}W$ (4) 2 W

48. Why small soft iron cylinder is placed at the axis of the coil in Galvanometer?

(1) To produce uniform radial magnetic field.

(2) For support of spring

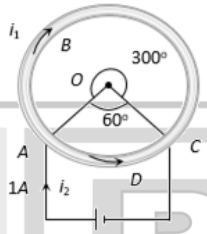
(3) To maintain electric potential difference

(4) To produce tangential uniform magnetic field.

49. The current Capacity of ammeter having 9Ω resistance is 1A. Now to make its capacity 10A, What shunt is required?

(1) 0.01Ω (2) 0.1Ω (3) 1Ω (4) 0.09Ω

50. A cell is connected between the points A and C of a circular conductor ABCD of centre O with angle A $OC = 60^o$. If B_1 and B_2 are the magnitudes of the magnetic fields at O due to the currents in ABC and ADC respectively, the ratio $\frac{B_1}{B_2}$ is



(1) 0.2 (2)6 (3) 1 (4)5

PART- B

Instructions:

(1) Write in a clear legible handwriting.

(2) There are three sections in part- B of the question paper and total 1 to 27 questions are there.

(3) All the questions are compulsory. Internal options are given.

(4) The numbers at right side represent the marks of the question.

(5) Start new section on new page.

(6) Maintain sequence.

(7) Students may use a calculator and log-table, if necessary.

SECTION – A

- **Answer question No. 1 to 12 as directed. Each question carry 2 marks. (Attempt any 8 out of 12)** **[16]**

1. Draw a plot showing the variation of:

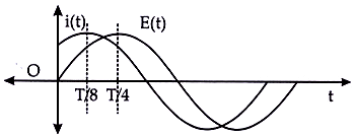
(i) electric field (E) and (ii) electric potential (V)

With distance r due to a point charge Q.

2. State Kirchhoff's rules. Explain briefly how these rules are justified.

3. If magnetic monopoles existed, how would Gauss law of magnetism be modified?

4. The figure shows two sinusoidal curves representing oscillating supply voltage and current in an ac circuit.



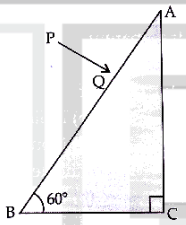
Draw a phasor diagram to represent the current and supply voltage appropriately as phasors. State the phase difference between the two quantities.

5. If light wavelength 412.5 nm is incident on each of the metals given below, which on of the following will show photoelectric emission and why?

Metal	Work Function (eV)
Na	1.92
K	2.15
Ca	3.20
Mo	4.17

6. Define the distance of closest approach. An a-particle of kinetic energy 'K' is bombarded on a thin gold foil. The distance of the closest approach is 'r'. What will be the distance of closest approach for an a- particle of double the kinetic energy?

7. A ray PQ incident normally on the refracting face BA is refracted in the prism BAC made of material of refractive index 1.5. Complete the path of ray through the prism. From which face will the ray emerge? Justify your answer.



8. Distance between 'intrinsic' and extrinsic' semiconductors.

9. A rectangle coil of sides 'l' and 'b' carrying a current I is subjected to a uniform magnetic field $\vec{B}$, acting perpendicular to its plane. Obtain the expression for the torque acting on it..

10. Five charge, q each are placed at the corners of a regular pentagon of side 'a' . (i) What will be the electric field at O if the charge from one of the corners (say A) is removed ? (ii) what will be the electric field at O if the charge q at A is replaced by-q?

11. Calculate the amount of work done to dissociate a system of three charge 1 μC, 1 μC and -4 μC placed on the vertices of an equilateral triangle of side 10 cm.

12. A square shaped plane coli of area 100 cm^2 of 200 turns carries a steady current of 5 A. It is placed in a uniform magnetic field of 0.2 T acting perpendicular to the plane of the coil. Calculate the torque on the coil when its plane makes an angle of 60° with the direction of the field. In which orientation will the coil be in stable equilibrium?

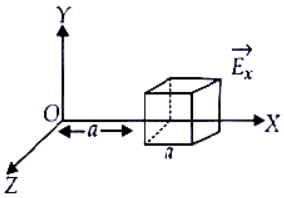
SECTION – B

- **Answer question No.13 to 21 as directed. Each question carry 3 marks. (Attempt any 6 out of 9) [18]**

13. (1) Derive an expression for the velocity $\vec{v}_c$ of a positive ion passing undeflected through a region where crossed and uniform electric field $\vec{E}$ and magnetic field $\vec{B}$ are simultaneously present.

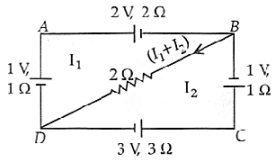
(2) Draw and justify the trajectory of identical positive ion whose velocity has a magnitude less than $\left|\vec{v}_c\right|$.

14. Define electric flux and write its SI unit. The electric field components in the figure shown are: Ex = a_x,E_y = 0, E_z = 0 where a = 100 N/C m



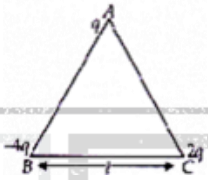
Calculate the charge within the cube, assuming a = 0.1 m.

15. Using Kirchhoff's rules, calculate the potential difference between B and D in the circuit diagram as shown in the figure



16. Define mutual inductance between a pair of coils. Derive an expression for the mutual inductance of two long coaxial solenoids of same length wound one over the other.

17. (i) Three point charge q,-4q and 2q placed at the vertices of an 3 equilateral triangle ABC of side 'l' as shown in the figure. Obtain the expression for the magnitude of the resultant electric force acting on the charge q.



(ii) Find out the amount of the work done to separate the charges at infinite distance.

18. (i) Monochromatic light of wavelength 589 nm is incident from air on a water surface. If μ for water is 1.33 find the wavelength, frequency and speed of the refracted light.

(ii) A double convex lens is made of a glass of refractive, index 1.55, with both faces of the same radius of curvature. Find the radius of curvature required, if the focal length is 20 cm

19. An electron of mass m_e revolves around a nucleus of charge $+Z_e$. Show that it behaves like a tiny magnetic dipole. Hence, prove that the magnetic moment associated with it is expressed as $\vec{\mu} = -\frac{e}{2m_e}\vec{L}$ is the orbital angular momentum of the electron.

Give the significance of negative sign.

20. An unpolarised light is incident on the boundary between two transparent media. State the condition when the reflected wave is totally plane polarised. Find out the expression for the angle of incidence in this case.

21. (i) An iron-cored solenoid has self-inductance 2.8 H. When the core is removed, the self inductancebecomes 2mH. What is the relative permeability of the core used?

(ii) The electric potential is constant in a given region. What will be the nature of the electric field in that region?

SECTION – C

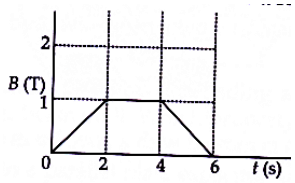
▪ **Answer question No. 22 to 27 as directed. Each question carry 4 marks. (Attempt any 4 out of 6) [16]**

22. (i) Draw a labeled diagram of a step – up transformer. Obtain the ratio of secondary to primary voltage in term of number of turns and currents in the two coils.

(ii) A power transmission line feeds input power at 2200 V to a step – down transformer with its primary windings having 3000 turns. Find the number of turns in the secondary to get power output at 220 V**.**

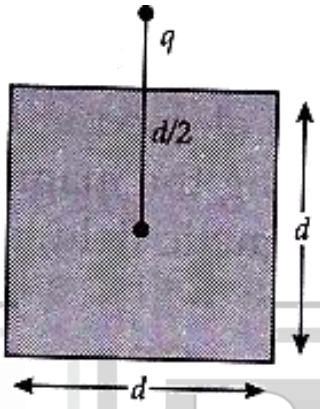
23. (i) State Faraday's laws of electromagnetic induction.

(ii) The magnetic field though a circular loop of wire 12 cm in radius and 8.5 W resistance, changes with time as shown in the figure. The magnetic field is perpendicular to the plane of the loop. Calculate the induced current in the loop and plot it as a function if time.



(iii) Show that Lenz's law is a consequence of conservation of energy.

24. (i) Define electric flux. Is it a scalar or a vector quantity? A point charge q is at a distance of d/2 directly above the centre of a square of side d, as shown in the figure. Use Gauss's law to obtain the expression for the electric flux through the square.



(ii) If the point charge is now moved to a distance 'd' from the centre of the square and the side of the square is doubled, explain how the electric flux will be affected.

25. (i) State the principal of an ac generator and explain its working with the help of a labelled diagram. Obtain the expression for the emf induced in a coil having N turns each of cross – sectional area A, rotating with a constant angular speed 'w' in a magnetic field B, directed perpendicular to the axis of rotation.

(ii) When a charged particle moving with velocity $\vec{v}$ is subjected to magnetic field $\vec{B}$, the force acting on it is non-zero. Would the particle gain any energy?

26. (i) Derive the mirror formula. What is the corresponding formula for a thin lens?

(ii) Draw a ray diagram to show the image formation by a concave mirror when the object is kept between its focus and the pole. Using this diagram, derive the magnification formula for the image formed.

27. (i) Explain with the help of suitable diagram, the two processes which during the formation of a p-n junction diode. Hence define the terms (1) depletion region and (2) potential barrier.

(ii) Draw a circuit diagram of a p-n junction diode under forward bias and explain its working.