

SAIVEERA ACADEMY 8098850809

PEELAMEDU , COIMBATORE

12TH Quarterly Model Question Papers

Physics

For

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SAIVEERA ACADEMY – 8098850809
REVOLUTION FOR LEARNING - COIMBATORE
12TH QUARTERLY EXAM MODEL QUESTION PAPER – 1
PHYSICS

Marks :70

Time : 2 hr 30min

PART – I

Note : (i) Answer all the questions.

15x1=15

(ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

1 Which charge configuration produces a uniform electric field?

- (a) point Charge (b) infinite uniform line charge
(c) uniformly charged infinite plane (d) uniformly charged spherical shell

2. A simple pendulum with charged bob is oscillating with time period T and let θ be the angular displacement. If the uniform magnetic field is switched ON in a direction perpendicular to the plane of oscillation then

- (a) time period will decrease but θ will remain constant
(b) time period remain constant but θ will decrease
(c) both T and θ will remain the same
(d) both T and θ will decrease

3. A capacitor of capacitance $6 \mu\text{F}$ is connected to a 100 V battery. The energy stored in the capacitor is

- (a) 30 J (b) 3 J (c) 0.03 J (d) 0.06 J

4. A circular coil with a cross-sectional area of 4 cm^2 has 10 turns. It is placed at the centre of a long solenoid that has 15 turns/cm and a cross-sectional area of 10 cm^2 . The axis of the coil coincides with the axis of the solenoid. What is their mutual inductance?

- (a) $7.54 \mu\text{H}$ (b) $8.54 \mu\text{H}$ (c) $9.54 \mu\text{H}$ (d) $10.54 \mu\text{H}$

5. Which of the following is NOT true for electromagnetic waves?.

- (a) it transport energy
(b) it transport momentum
(c) it transport angular momentum
(d) in vacuum, it travels with different speeds which depend on their frequency

6. Which of the following electromagnetic radiation is used for viewing objects through fog

- (a) microwave (b) gamma rays
(c) X- rays (d) infrared

7. Two point charges $+q$ and $-q$ are placed at points A and B respectively separated by a small distance. The electric field intensity at the midpoint O of AB

- (a) is zero (b) acts along AB
(c) acts along BA (d) acts perpendicular to AB

8. A non- polar dielectric is placed in an electric field (E), its induced dipole moment

- (a) is zero (b) acts in the direction of E
(c) acts opposite to the direction of E (d) acts perpendicular to E

9. When the charge given to a capacitor is doubled, its capacitance

- (a) increases twice (b) decreases twice
(c) increases four times (d) does not change

10. In a transformer, the number of turns in the primary and the secondary are 410 and 1230 respectively. If the current in primary is 6A, then that in the secondary coil is
 (a) 2 A (b) 18 A (c) 12 A (d) 1 A
11. If the length of a copper wire has a certain resistance R, then on doubling the length its specific resistance
 (a) will be doubled (b) will be 1/4th
 (c) will become four times (d) will remain the same
12. AB is a rod of lead, The end A is heated. A current I is allowed to flow along AB. Now due to Thomson effect in rod AB
 (a) heat is absorbed (b) heat is liberated
 (c) heat is neither absorbed nor liberated (d) heat is first absorbed and then liberated
13. A galvanometer is converted into a voltmeter by connecting a
 (a) low resistance in series (b) high resistance in parallel
 (c) high resistance in series (d) low resistance in parallel
14. $e = 200 \sin(\omega t + \pi/3)$ and $i = 10 \sin \omega t$ The average power consumed over one complete cycle is:
 (a) 2000 W (b) 1000 W (c) 500 W (d) 707 W
15. The effective value of alternating current is
 (a) $\frac{I_0}{2}$ (b) $\frac{I_0}{\sqrt{2}}$ (c) $I_0 \sqrt{2}$ (d) $2 I_0$

PART – II

Answer any six questions and question number **24** is compulsory.

6 x 2=12

16. The electric field lines never intersect Justify.
17. State the applications of Seebeck effect.
18. State Coulomb's inverse law
19. Calculate the magnetic field at the centre of a square loop which carries a current of 1.5 A and length of each loop is 50 cm
20. How will you define Q-factor?
21. What is meant by Fraunhofer lines?
22. Write down the integral form of modified Ampere's circuital law.
23. The equation for an alternating current is given by $i = 77 \sin 314t$. Find the peak value, frequency, time period and instantaneous value at $t = 2$ ms.
24. The repulsive force between two magnetic poles in air is 9×10^{-3} N. If the two poles are equal in strength and are separated by a distance of 10 cm, calculate the pole strength of each pole.

PART – III

Answer any six questions and question number **33** is compulsory.

6 x 3 =18

25. Obtain the expression for capacitance for a parallel plate capacitor.
26. Compare dia, para and ferro-magnetism.
- 27 The total number of electrons in the human body is typically in the order of 10^{28} . Suppose, due to some reason, you and your friend lost 1% of this number of electrons. Calculate the electrostatic force between you and your friend separated at a distance of 1m. Compare this with your weight Assume mass of each person is 60 kg and use point charge approximation.

28. Deduce the relation for the magnetic induction at a point due to an infinitely long straight conductor carrying current.
- 29 Show that Lenz's law is in accordance with the law of conservation of energy.
30. How will you induce an emf by changing the area enclosed by the coil?
31. Obtain an expression for average power of AC over a cycle. Discuss its special cases.
32. Write short notes on i) X-rays ii) γ -rays
- 33 The resistance of a wire is 20Ω . What will be new resistance, if it is stretched uniformly 8 times its original length?

PART – IV

Answer all the questions.

5 x 5 =25

34 (i). Obtain an expression for potential energy due to a collection of three point charges which are separated by finite distances.

Or

(ii). How the emf of two cells are compared using potentiometer?

35.(i). Explain the working of a single-phase AC generator with necessary diagram.

Or

(ii). Discuss the various properties of conductors in electrostatic equilibrium and derive an expression for energy stored in the parallel plate capacitor

36.(i). Show mathematically that the rotation of a coil in a magnetic field over one rotation induces an alternating emf of one cycle.

Or

(ii). What is absorption spectra?. Give their types.

37.(i) Obtain the expression for electric field due to an infinitely long charged wire & expression for electric field due to an charged infinite plane sheet.

Or

(ii). Calculate the magnetic field inside and outside of the long solenoid using Ampere's circuital law.

38.(i). Explain the principle and working of a moving coil galvanometer.

Or

(ii) Derive an expression for phase angle between the applied voltage and current in a series RLC circuit.

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12TH QUARTERLY EXAM MODEL QUESTION PAPER – 2
PHYSICS

Marks :70

Time : 2 hr 30min

PART – I

Note : (i) Answer all the questions.

15x1=15

(ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

1 Two points A and B are maintained at a potential of 7 V and -4 V respectively. The work done in moving 50 electrons from A to B is

- (a) 8.80×10^{-17} J (b) -8.80×10^{-17} J
(c) 4.40×10^{-17} J (d) 5.80×10^{-17} J

2 A thin insulated wire forms a plane spiral of $N = 100$ tight turns carrying a current $I = 8$ mA (milli ampere) The radii of inside and outside turns are $a = 50$ mm and $b = 100$ mm respectively. The magnetic induction at the centre of the spiral is

- (a) $5 \mu\text{T}$ (b) $7 \mu\text{T}$ (c) $8 \mu\text{T}$ (d) $10 \mu\text{T}$

3 An inductor 20 mH, a capacitor $50 \mu\text{F}$ and a resistor 40Ω are connected in series across a source of emf $v = 10 \sin 340 t$. The power loss in AC circuit is

- (a) 0.76 W (b) 0.89 W (c) 0.46 W (d) 0.67 W

4. Which of the following is an electromagnetic wave?

- (a) α – rays (b) β - rays (c) γ – rays (d) all of them

5. Which one of them is used to produce a propagating electromagnetic wave?.

- (a) an accelerating charge (b) a charge moving at constant velocity
(c) a stationary charge (d) an uncharged particle

6. Point charges $+q$, $+q$, $-q$ and $-q$ are placed at the corners A,B,C and D respectively of a square is the point of intersection of the diagonals AC and BD. The resultant electric field intensity at the point O

- (a) acts in a direction parallel to AB (b) acts in a direction parallel to BC
(c) acts in a direction parallel to CD (d) is zero

7. The electric field intensity at a distance r due to infinitely long straight charged wire is directly proportional to

- (a) r (b) $1/r$ (c) r^2 (d) $1/r^2$

8. In an a.c. circuit, the voltage leads the current by a phase of $\frac{\pi}{2}$, then the circuit has

- (a) Only an inductor (L) (b) only a capacitor (C)
(c) only a resistor (R) (d) L, C and R in series

9 In an A.c. circuit average power consumed is 200 W and the apparent power is 300 W. the power factor is

- (a) 1.5 (b) 0.66 (c) 0.33 (d) 1

10. The torque on a rectangular coil placed in a uniform magnetic field is large, when :

- (a) the number of turns is large (b) the number of turns is less
(c) the plane of the coil is perpendicular to the field (d) the area of the coil is small

11. In a tangent galvanometer a current 1 A, produces a deflection of 30° . The current required to produce a deflection of 60° is

- (a) 3A (b) 2A (c) $\sqrt{3}$ A (d) $1/\sqrt{3}$ A

12. In a series resonant RLC circuit, the voltage across $100\ \Omega$ resistor is $40\ \text{V}$. The resonant frequency ω is $250\ \text{rad/s}$. If the value of C is $4\ \mu\text{F}$, then the voltage across L is
 (a) $600\ \text{V}$ (b) $4000\ \text{V}$ (c) $400\ \text{V}$ (d) $1\ \text{V}$
13. The electrical resistivity of a thin copper wire and a thick copper rod are respectively $p_1\ \Omega\ \text{m}$ and $p_2\ \Omega\ \text{m}$. Then :
 (a) $p_1 > p_2$ (b) $p_2 > p_1$ (c) $p_1 = p_2$ (d) $p_2/p_1 = \infty$
14. Van de Graff generator works on the principle of :
 (a) electromagnetic induction and action of points
 (b) electrostatic induction and action of points
 (c) electrostatic induction only
 (d) action of points only
15. The unit of molecular polarisability is
 (a) $\text{C}^2\text{N}^{-1}\ \text{m}$ (b) $\text{Nm}^2\ \text{C}^{-1}$ (c) $\text{N}^{-1}\ \text{m}^{-2}\ \text{C}^2$ (d) $\text{C}^{-1}\ \text{m}^2\text{V}$

PART – II

Answer any six questions and question number **24** is compulsory.

6x2=12

16. Define 'capacitance'. Give its unit.
 17. Define temperature coefficient of resistance.
 18. State Ampere's circuital law.
 19. What are step-up and step-down transformers?
 20. What is meant by electromagnetic induction?
 21. A transmitter consists of LC circuit with an inductance of $1\ \mu\text{H}$ and a capacitance of $1\ \mu\text{F}$. What is the wavelength of the electromagnetic waves it emits?
 22. Define electric polarisation
 23. An electric power of $2\ \text{MW}$ is transmitted to a place through transmission lines of total resistance, say $R = 40\ \Omega$ at $10\ \text{kV}$. Calculate the power losses.
 24. Consider a point charge $+q$ placed at the origin and another point charge $-2q$ placed at a distance of $9\ \text{m}$ from the charge $+q$. Determine the point between the two charges at which electric potential is zero.

PART – III

Answer any six questions and question number **33** is compulsory.

6x3=18

25. Derive an expression for the torque experienced by a dipole due to a uniform electric field.
 26. Compute the torque experienced by a magnetic needle in a uniform magnetic field
 27. Obtain an expression for motional emf from Lorentz force.
 28. Find out the phase relationship between voltage and current in a pure inductive circuit.
 29. When two resistances connected in series and parallel their equivalent resistances are $15\ \Omega$ and $56/15\ \Omega$ respectively. Find the individual resistances.
 30. A coil of a tangent galvanometer of diameter $0.24\ \text{m}$ has 100 turns. If the horizontal component of Earth's magnetic field is $25 \times 10^{-6}\ \text{T}$ then, calculate the current which gives a deflection of 60° .
 31. Derive an expression for an electric potential due to a point charge
 32. Discuss briefly the experiment conducted by Hertz to produce and detect electromagnetic spectrum.
 33. Calculate the current that flows in the $1\ \Omega$ resistor in the following circuit.

PART – IV

Answer all the questions.

5x5=15

34 (i) Calculate the electric field due to a dipole on its axial line and equatorial plane.

Or

(ii) Explain the construction and working of transformer.

35 (i). Explain the equivalent resistance of a series and parallel resistor network

Or

(ii) Elaborate the standard construction details of AC generator.

36.(i). Explain the determination of unknown resistance using meter bridge

Or

(ii) Explain the Maxwell's modification of Ampere's circuital law.

37.(i) Explain in detail the construction and working of a Van de Graaff generator.

Or

(ii). Obtain the magnetic induction at a point on the equatorial line of a bar magnet.

38.(i). Obtain a relation for the magnetic induction at a point along the axis of a circular coil carrying current.

Or

(ii). Show that total energy is conserved during LC oscillations

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12TH QUARTERLY EXAM MODEL QUESTION PAPER - 3
PHYSICS

Marks :70

Time : 2 hr 30min

PART - I

Note : (i) Answer all the questions.

15x1=15

(ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer

1. If voltage applied on a capacitor is increased from V to $2V$, choose the correct conclusion.
(a) Q remains the same, C is doubled
(b) Q is doubled, C doubled
(c) C remains same, Q doubled
(d) Both Q and C remain same
2. The vertical component of Earth's magnetic field at a place is equal to the horizontal component. What is the value of angle of dip at this place?
(a) 30° (b) 45° (c) 60° (d) 90°
3. When the current changes from $+2A$ to $-2A$ in 0.05 s, an emf of 8 V is induced in a coil. The co-efficient of self-induction of the coil is
(a) 0.2 H (b) 0.4 H (c) 0.8 H (d) 0.1 H
4. When a point charge of $6\mu C$ is moved between two points in an electric field, the work done is 1.8×10^{-5} J. The potential difference between the two points is
(a) 1.08 V (b) 1.08 mV (c) 3 V (d) 30 V
5. When an electric dipole of dipole moment P is aligned parallel to the electric field E then the potential energy of the dipole is given as
(a) PE (b) zero (c) $-PE$ (d) $PE/2$
6. A step-down transformer reduces the supply voltage from 220 V to 11 V and increase the current from 6 A to 100 A. Then its efficiency is
(a) 1.2 (b) 0.83 (c) 0.12 (d) 0.9
7. A circular coil of radius 5 cm and 50 turns carries a current of 3 ampere. The magnetic dipole moment of the coil is
(a) 1.0 amp - m^2 (b) 1.2 amp - m^2
(c) 0.5 amp - m^2 (d) 0.8 amp - m^2
8. Which of the following are false for electromagnetic waves
(a) transverse (b) mechanical waves
(c) longitudinal (d) produced by accelerating charges
9. During the propagation of electromagnetic waves in a medium:
(a) electric energy density is double of the magnetic energy density
(b) electric energy density is half of the magnetic energy density
(c) electric energy density is equal to the magnetic energy density
(d) both electric and magnetic energy densities are zero
10. The transition temperature of mercury is
(a) $4.2^\circ C$ (b) 4.2 K (c) $2.4^\circ C$ (d) 2.4 K
11. A cell of emf 2.2 V sends a current of 0.2 A through a resistance of 10Ω . The internal resistance of the cell is
(a) 0.1Ω (b) 1Ω (c) 2Ω (d) 1.33Ω

12. The torque experienced by a rectangular current loop placed perpendicular to a uniform magnetic field is
 (a) maximum (b) zero (c) finite minimum (d) infinity
13. The period of revolution of a charged particle inside a cyclotron does not depend on
 (a) the magnetic induction (b) the charge of the particle
 (c) the velocity of the particle (d) the mass of the particle
14. The Q-factor (quality factor) of an a c, circuit containing a resistance L and capacitor C is
 (a) $Q = \frac{1}{\sqrt{LC}}$ (b) $Q = \frac{1}{R} \sqrt{\frac{C}{L}}$ (c) $Q = \frac{1}{R} \sqrt{\frac{L}{C}}$ (d) $Q = \frac{1}{\sqrt{LCR}}$
15. A coil of area of cross – section 0.5m^2 with 10 turns is in a plane which is perpendicular to a uniform magnetic field of 0.2 Wb/m^2 The magnetic flux through the coil is
 a) 100 Wb b) 10 Wb c) 1 Wb d) zero

PART – II

Answer any six questions and question number 24 is compulsory. 6x2=12

16. What is corona discharge and write down its application
17. State Fleming's right hand rule.
18. Mention the ways of producing induced emf.
19. The relative magnetic permeability of the medium is 2.5 and the relative electrical permittivity of the medium is 2.25. Compute the refractive index of the medium.
20. Write the difference between polar and non polar molecule
21. The self-inductance of an air-core solenoid is 4.8 mH. If its core is replaced by iron core, then its self-inductance becomes 1.8 H Find out the relative permeability of iron
- 22 Define one ampere
- 23.State Tangent law
24. A potentiometer wire has a length of 4 m and resistance of 20Ω . It is connected in series with resistance of 2980Ω and a cell of emf 4 V. Calculate the potential along the wire .

PART – III

Answer any six questions and question number 33 is compulsory. 6x3=18

25. Derive the expression for resultant capacitance, when capacitors are connected in series
26. Explain the determination of the internal resistance of a cell using voltmeter.
27. A battery has an emf of 12 V and connected to a resistor of 3Ω . The current in the circuit is 3.93 A. Calculate (a) terminal voltage and the internal resistance of the battery (b) power delivered by the battery and power delivered to the resistor
28. Write short notes on (a) microwave (b) X-ray (c) radio waves
29. Derive an expression for potential energy of bar magnet in a uniform magnetic field.
30. The coil of a moving coil galvanometer has 5 turns and each turn has an effective area of $2 \times 10^{-2} \text{ m}^2$. It is suspended in a magnetic field whose strength is $4 \times 10^{-2} \text{ Wb m}^{-2}$. If the torsional constant K of the suspension fibre is $4 \times 10^{-9} \text{ N m deg}^{-1}$.
 (a) Find its current sensitivity in degree per micro - ampere.
 (b) Calculate the voltage sensitivity of the galvanometer for it to have full scale deflection of 50 divisions for 25 mV.
 (c) Compute the resistance of the galvanometer.
31. Find out the phase relationship between voltage and current in a pure inductive circuit.

32. Using Faraday's law of electromagnetic induction, derive an expression for motional emf.

33. A parallel plate capacitor has square plates of side 5 cm and separated by a distance of 1 mm. (a) Calculate the capacitance of this capacitor. (b) If a 10 V battery is connected to the capacitor, what is the charge stored in any one of the plates?

The value of $\epsilon_0 = 8.85 \times 10^{-12} \text{ Nm}^2 \text{ C}^{-2}$

PART – IV

Answer all the questions.

5x5=15

34. (i). Derive an expression for electrostatic potential due to an electric dipole.

Or

(ii). Obtain the condition for bridge balance in Wheatstone's bridge.

35.(i). Mention the various energy losses in a transformer.

Or

(ii). Write down the properties of electromagnetic waves.

36.(i). Obtain the expression for electric field due to a uniformly charged spherical shell.

Or

(ii). Give the uses of Foucault current

37.(i). Calculate the magnetic induction at a point on the axial line of a bar magnet.

Or

(ii). How are the three different emfs generated in a three-phase AC generator? Show the graphical representation of these three emfs.

38.(i). Explain the construction and working of transformer.

Or

(ii). Discuss the working of cyclotron in detail