

Class : 12

Register  
Number**COMMON QUARTERLY EXAMINATION - 2024 - 25**

Time Allowed : 3.00 Hours]

**PHYSICS**

[Max. Marks : 70

**PART-I**

15x1=15

**I. Choose the correct answer.**

- If voltage applied on a capacitor is increased from  $V$  to  $2V$ , choose the correct conclusion.
  - $Q$  remains the same,  $C$  is doubled
  - $Q$  is doubled,  $C$  doubled
  - Both  $Q$  and  $C$  remain same
  - $C$  remains same,  $Q$  doubled
- An electric field  $\vec{E}_x = 10x\hat{i}$  exists in a certain region of space. Then the potential difference  $V = V_o - V_A$ , where  $V_o$  is the potential at the origin and  $V_A$  is the potential at  $x = 2m$  is :
  - 10 V
  - +20 V
  - 20 V
  - 10 V
- 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
  - $800^{\circ}C$
  - $700^{\circ}C$
  - $820^{\circ}C$
  - $850^{\circ}C$
- A circular coil of radius 5 cm and 50 turns carries a current of 3 ampere. The magnetic dipole moment of the coil is nearly
  - $1.0 Am^2$
  - $0.5 Am^2$
  - $1.2 Am^2$
  - $0.8 Am^2$
- 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
  - $\frac{q}{m}$
  - $\frac{2q}{m}$
  - $\frac{q}{4m}$
  - $\frac{q}{2m}$
- The flux linked with a coil at any instant  $t$  is given by  $\phi_b = 10t^2 - 50t + 250$ . The induced emf at  $t = 3$  s is
  - 190 V
  - 10 V
  - 10 V
  - 190 V
- 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
  - 18 A
  - 2 A
  - 12 A
  - 1 A
- The electric and the magnetic fields, associated with an electromagnetic wave, propagating along negative X axis can be represented by
  - $\vec{E} = E_o \hat{j}$  and  $\vec{B} = B_o \hat{k}$
  - $\vec{E} = E_o \hat{j}$  and  $\vec{B} = B_o \hat{i}$
  - $\vec{E} = E_o \hat{i}$  and  $\vec{B} = B_o \hat{j}$
  - $\vec{E} = E_o \hat{k}$  and  $\vec{B} = B_o \hat{j}$
- Stars twinkle due to,
  - Reflection
  - Refraction
  - Total internal reflection
  - Polarisation
- Two equal capacitors are first connected in series and then in parallel. The ratio of equivalent capacitor in the two cases will be
  - 4:1
  - 2:1
  - 1:4
  - 4:8
- A  $200 \Omega$  resistor has a certain colour code. If one replace the red colour by green in the code. Then the new resistance will be
  - $100 \Omega$
  - $300 \Omega$
  - $400 \Omega$
  - $500 \Omega$
- A particle of mass  $m$  and charge  $q$  has an initial velocity  $\vec{v} = v_o \hat{j}$ . If an electric field  $\vec{E} = E_o \hat{j}$  and magnetic field  $\vec{B} = B_o \hat{j}$  act on the particle, its speed will double after a time
  - $\frac{\sqrt{3}mv_o}{qE_o}$
  - $\frac{3mv_o}{qE_o}$
  - $\frac{2mv_o}{qE_o}$
  - $\frac{\sqrt{2}mv_o}{qE_o}$
- In an AC circuit, an inductor, a capacitor, and a resistor is connected in series with  $XL=R=XC$ , impedance of this circuit is
  - $R$
  - $R\sqrt{2}$
  - $2R^2$
  - Zero
- For a plane EMW propagating in x-direction, which one of the following combination gives the correct possible direction for Electric field (E) and magnetic field (B) respectively
  - $-\hat{j} - \hat{k}, -\hat{j} - \hat{k}$
  - $\hat{j} + \hat{k}, \hat{j} + \hat{k}$
  - $-\hat{j} - \hat{k}, -\hat{j} - \hat{k}$
  - $\hat{j} + \hat{k}, -\hat{j} - \hat{k}$

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15. The critical Angle of a medium for a Specific wavelength, If the medium has relative permittivity 3 and relative permeability  $\frac{4}{3}$ . For this wavelength, will be  
 (a)  $30^\circ$  (b)  $45^\circ$  (c)  $15^\circ$  (d)  $60^\circ$

## PART - II

II. Answer any six questions. Question No. 24 is compulsory.

6x2 = 12

16. How will you define Q - factor?  
 17. Give two uses of IR radiation.  
 18. Compute the speed of the electromagnetic Wave in a medium if the amplitude of Electric and magnetic fields are  $3 \times 10^4 \text{ N C}^{-1}$  and  $2 \times 10^{-4} \text{ T}$ , respectively.  
 19. What is Peltier effect?  
 20. State Ampere's circuital law.  
 21. What is an equipotential surface?  
 22. Why does sky appear blue?  
 23. How will you increased the current sensitivity of a galvanometer?  
 24. Resistance of a material at  $20^\circ\text{C}$  and  $40^\circ\text{C}$  Are  $45 \Omega$  and  $85 \Omega$  respectively. Find its Temperature coefficient of resistivity.

## PART - III

III. Answer any six questions. Question No. 33 is compulsory

6x3 = 18

25. Obtain the expression for energy stored in the parallel plate capacitor.  
 26. The repulsive force between two magnetic poles in air is  $9 \times 10^{-3} \text{ N}$ . If the two poles are equal in strength and are separated by a distance of 10 cm, calculate the pole strength of each pole.  
 27. Mention the various energy losses in a transformer.  
 28. Derive the relation between f and R for a spherical mirror.  
 29. Discuss the conversion of galvanometer into an a voltmeter.  
 30. Obtain the expression for electric field due to an charged infinite plane sheet.  
 31. Explain the equivalent resistance of a series resistor network.  
 32. State any six properties of electromagnetic waves.  
 33. Find the impedance of a series RLC circuit if the inductive reactance, capacitive reactance and resistance are  $184 \Omega$ ,  $144 \Omega$  and  $30 \Omega$  respectively. Also calculate the phase angle between voltage and current.

## PART - IV

IV. Answer all the questions.

5x5 = 25

34. a) What is spectrum? Explain the types of emission spectrum.  
 (OR)  
 b) Obtain Lens maker's formula  
 35. a) Derive the expression for Production of induced emf by changing relative orientation of the coil with the magnetic field. (OR)  
 b) Derive the expression for force between two long parallel current carrying Conductors.  
 36. a) Write the electrostatic Gauss law and Obtain the expression for electric field due to an infinitely long charged wire. (OR)  
 b) How the emf of two cells are compared using potentiometer?  
 37. a) Derive an expression for phase angle between the applied voltage and current in a series RLC circuit. (OR)  
 b) Describe the microscopic model of current and obtain microscopic form of Ohm's law.  
 38. a) Calculate the electric field due to a dipole on its equatorial plane. (OR)  
 b) Explain the principle and working of a moving coil galvanometer.

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