

KARUR DIST

QL
12 - Std

QUARTERLY COMMON EXAMINATION - 2024
PHYSICS

Marks : 70

Time : 3.00 Hrs

15 X 1 = 15

- I Choose the best answer :
- Two wires of A and B with circular cross section made up of the same material with equal lengths. Suppose $R_A = 3R_B$ then what is the ratio of radius of wire A to that of B?
(a) 3 (b) $\sqrt{3}$ (c) $\frac{1}{\sqrt{3}}$ (d) $\frac{1}{3}$
 - The force experienced by a particle having mass m and charge q accelerated through a potential difference V when it is kept under perpendicular magnetic field \vec{B} is
(a) $\sqrt{\frac{2q^3B^2V}{m}}$ (b) $\sqrt{\frac{q^3B^2V}{2m}}$ (c) $\sqrt{\frac{2q^3BV}{m}}$ (d) $\sqrt{\frac{q^3BV}{m^3}}$
 - 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
 - For light incident from air onto a slab of refractive index 2. Maximum possible angle of refraction is,
(a) 30° (b) 45° (c) 60° (d) 90°
 - Which of the following is an electromagnetic wave?
(a) α - rays (b) β - rays (c) γ - rays (d) all of them
 - Which charge configuration produces a uniform electric field?
(a) point Charge (b) uniformly charged infinite plane
(c) infinite uniform line charge (d) uniformly charged spherical shell
 - A parallel plate capacitor stores a charge Q at a voltage V . Suppose the area of the parallel plate capacitor and the distance between the plates are each doubled then which is the quantity that will change?
(a) Capacitance (b) Charge (c) Voltage (d) Energy density
 - A wire connected to a power supply of 230 V has power dissipation P_1 . Suppose the wire is cut into two equal pieces and connected parallel to the same power supply. In this case power is dissipation is P_2 , The ratio $\frac{P_2}{P_1}$ is
(a) 1 (b) 2 (c) 3 (d) 4
 - Stars twinkle due to,
(a) reflection (b) total internal reflection (c) polarisation (d) refraction
 - A non-conducting charged ring of charge q , mass m and radius r is rotated with constant angular speed ω . Find the ratio of its angular momentum with magnetic moment is
(a) $\frac{q}{m}$ (b) $\frac{2m}{q}$ (c) $\frac{q}{2m}$ (d) $\frac{q}{4m}$
 - In an electromagnetic wave in free space the rms value of the electric field is 3 V m. The peak value of the magnetic field is
(a) 1.414×10^{-8} T (b) 1.0×10^{-8} T (c) 2.828×10^{-8} T (d) 2.0×10^{-8} T
 - The flux linked with a coil at any instant t is given by $\phi_B = 10t^2 + 130t - 250$. The induced emf at $t = 3$ s is
(a) -190V (b) -10 V (c) 10 V (d) 190 V
 - The resistance of a wire of 1m length and 0.034 mm^2 area cross section having a specific resistance of $1.7 \times 10^{-8} \Omega \text{ m}$ is
(a) 0.5Ω (b) 5.0Ω (c) 2Ω (d) 0.05Ω

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14. Two straight parallel current carrying conductors separated by certain distance carrying equal current experience a force of 16N. If the distance between them is doubled and the current in each conductor is halves then the force between them will be
 (a) 64 N (b) 16 N (c) 4 N (d) 2N
15. An aeroplane having a wingspan of 35m flies at a speed of 100 m/s. If the vertical components of earth's magnetic field is $4 \times 10^{-4} T$, then the induced emf across the wingspan is
 (a) 28V (b) 2.8V (c) 14V (d) 1.4V

II Answer any six questions : Question no. 24 compulsory:

6 x 2 = 12

16. State Snell's law/ laws of refraction.
17. What is displacement current?
18. How will you define Q-factor?
19. State Ampere's circuital law.
20. Write a short note on super conductors?
21. Write down Coulomb's law in vector form and mention what each term represents
22. What for an inductor is used? Give examples.
23. In a meter bridge, the value of resistance in the resistance box is 10Ω . The balancing length is $l_1 = 55$ cm. Find the value of unknown resistance.
24. What is the focal length of the combination if a lens of focal length -70 cm is brought in contact with a lens of focal length 150 cm? What is the power of the combination?

III Answer any six questions : Question no. 33 compulsory:

6 X 3 = 18

25. Discuss the conversion of galvanometer into a voltmeter.
26. Write down the properties of electromagnetic waves.
27. Obtain the expression for electric field due to a charged infinite plane sheet.
28. Explain the determination of the internal resistance of a cell Using voltmeter
29. Mention the various energy losses in a transformer.
30. Derive an expression for electrostatic potential due to a point charge
31. Obtain the equation for apparent depth.
32. Let E be the electric field of magnitude $6.0 \times 10^6 N C^{-1}$ and B be the magnetic field magnitude $0.83T$. Suppose an electron is accelerated with a potential of $200 V$, will it show zero deflection?. If not, at what potential will it show zero deflection.
33. 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.

IV Answer all the questions:

5 X 5 = 25

34. Show that the mutual inductance between a pair of coils is same ($M_{12} = M_{21}$)
 (OR)
 Derive an expression for phase angle between the applied voltage and current in a series RLC circuit.
35. Derive the mirror equation and the equation for lateral magnification.
 (OR)
 Mention different parts of spectrometer and explain the Preliminary adjustments.
36. Obtain an expression for potential energy due to a collection of three point charges which are separated by finite distances. (OR)
 Explain in detail the construction and working of a Van de Graaff generator.
37. Explain the equivalent resistance of a series and parallel resistor network
 (OR)
 Discuss the working of Cyclotron in detail.
38. Explain the types of emission spectrum. (OR)
 Obtain the magnetic induction at a point on the equatorial line of a bar magnet.

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Quarterly Exam - 24
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1. இ) $\frac{1}{\sqrt{3}}$

2. அ) $\sqrt{\frac{29^3 B^2 V}{m}}$

3. இ) 0.83

4. அ) 30°

5. இ) 2 கதிர்கள்

6. இ) சீரான கதிர்க்குடும் மீட்டர்
அடிமையான சிவநீரம்.

7. அ) சீரான சுவீட்டி

8. அ) 4

9. அ) ஒளிவளகம்

10. ~~அ) $\frac{9\pi}{2}$~~ இ) $\frac{2\pi}{2}$

11. அ) $1.414 \times 10^{-8} T$

12. அ) $-190 V$

13. அ) 0.5Ω

14. அ) 2 N

15. அ) 1.4 V

Quarterly Exam '24 (Physics)

$$1. \quad l_1 = \frac{R_1 A_1}{l_1} \quad l_2 = l_1 \quad l_2 = \frac{R_2 A_2}{l_2}$$

$$l_1 = l_2 \quad l_1 = l_2$$

$$\frac{R_1 A_1}{l} = \frac{R_2 A_2}{l}$$

$$\frac{R_2}{R_1} = \frac{A_1}{A_2}$$

$$\frac{R_2}{R_1} = \frac{\pi r_1^2}{\pi r_2^2}$$

$$\frac{3R_2}{3R_2} = \frac{r_1^2}{r_2^2}$$

$$\boxed{\frac{1}{\sqrt{3}} = \frac{r_1}{r_2}}$$

$$c) \frac{1}{\sqrt{3}}$$

2.

$$\frac{1}{2}mv^2 = eV$$

$$v = \sqrt{\frac{2eV}{m}}$$

$$F = Bqv$$

$$F = Bq \times \sqrt{\frac{2eV}{m}}$$

$$F^2 = \frac{B^2 q^2 \times 2eV}{m} \quad e=q$$

$$\boxed{F = \sqrt{\frac{2B^2 q^3 V}{m}}}$$

3.

$$\eta = \frac{\text{Output}}{\text{Input}} = \frac{E_g T_s}{E_p T_p}$$

$$= \frac{4 \times 10^5}{220 \times 6} = \frac{5}{6}$$

$$\boxed{\eta = 0.83}$$

4.

$$n_1 \sin i_c = n_2 \sin r$$

$$n_1 = n \quad n_2 = n \quad i_c = 90^\circ$$

$$r = \sin^{-1} \left[\frac{1}{n} \right]$$

$$r = \sin^{-1} \left[\frac{1}{2} \right]$$

$$\boxed{r = 30^\circ}$$

5. a) உ - கிணர்

b. a) கிணர் கிணர்
கிணர் கிணர்

கிணர் கிணர் கிணர்

7. a) கிணர் கிணர்

$$8. P_1 = \frac{V^2}{R}$$

$$P_2 = \frac{V^2}{R_p}$$

$$R_p = \frac{R_1 R_2}{R_1 + R_2} = \frac{R^2/4}{R} = R/4$$

$$\frac{P_2}{P_1} = \frac{AV^2}{R} = 4$$

7. 4

9. d) கிணர் கிணர்

10.

$$P_L = \frac{\Delta A}{T} = \frac{q}{T} \pi r^2 = \frac{q}{2\pi r} \pi r^2 = \frac{\omega q r^2}{2}$$

$$L = r p = r m v = r m (r \omega) = r^2 m \omega$$

$$\frac{L}{P_L} = \frac{r^2 m \omega}{\frac{\omega q r^2}{2}} = \frac{2m}{q} \quad b) \frac{2m}{q}$$

$$11. c = \frac{E_0}{B_0}$$

$$B_0 = \frac{E_{rms} \sqrt{2}}{c}$$

$$B_0 = \frac{3 \times 1.414}{3 \times 10^8}$$

$$B_0 = 1.414 \times 10^{-8} \text{ T}$$

$$a) 1.414 \times 10^{-8} \text{ T}$$

$$12. \phi_B = 10t^2 + 130t - 250$$

$$\epsilon = -\frac{d\phi_B}{dt} = (20t + 130) \quad [t=3s]$$

$$\epsilon = (60 + 130)$$

$$\epsilon = -190 \text{ V}$$

$$a) -190 \text{ V}$$

$$13. l = 1 \text{ m} \quad A = 0.034 \times 10^{-6} \text{ m}^2$$

$$f = 1.7 \times 10^8 \text{ Hz}$$

$$R = \frac{\rho \cdot l}{A} = \frac{1.7 \times 10^{-8} \times 1}{50 \times 10^{-2} \times 10^{-6}}$$

$$R = 0.5 \Omega$$

$$a) 0.5 \Omega$$

$$14. \frac{F_0}{L} = \frac{\mu_0 I_1 I_2}{24r} \quad F_0 = 16 \text{ N}$$

$$F' = \frac{\mu_0 I_1 I_2 \left(\frac{1}{4}\right)}{24(2r)} = \frac{1}{8} [F_0] = \frac{1}{8} \times 16^2$$

$$F' = 2 \text{ N} \quad a) 2 \text{ N}$$

15.

$$\mathcal{E} = Blv$$

$$= 4 \times 10^{-4} \times 35 \times 100$$

$$= 140 \times 10^{-2}$$

$$\mathcal{E} = 1.4 \text{ V}$$

$$\text{Ans) } 1.4 \text{ V}$$

II.

23.

$$\frac{P}{Q} = \frac{l_1}{l_2}$$

$$P = Q \cdot \frac{l_1}{l_2}$$

$$P = ? \quad Q = 10 \Omega \quad l_1 = 55 \text{ cm}$$

$$l_2 = 45 \text{ cm}$$

$$P = 10 \times \frac{55}{45}$$

$$P = \frac{110}{9} = 12.2 \Omega$$

24.

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{-70} + \frac{1}{150} = \frac{-150 + 70}{10500}$$

$$= \frac{-80}{10500} \quad f = \frac{-10500}{8} = -1312.5 \text{ cm}$$

$$f = -1.3125 \text{ m}$$

$$P = \frac{1}{f} = \frac{1}{-1.3125} = -0.76 \text{ D}$$

32.

At zero deflection,

$$\text{The velocity } v_0 = \frac{E}{B} = \frac{6 \times 10^6}{0.83} = 7.229 \times 10^6 \text{ m/s}$$

$$\frac{1}{2} m v_{200}^2 = eV$$

$$v_{200} = \sqrt{\frac{2eV}{m}}$$

$$= \sqrt{\frac{2 \times 1.6 \times 10^{-19} \times 200}{9.1 \times 10^{-31}}} = \sqrt{\frac{640 \times 10^{-17}}{9.1}}$$

$$v_{200} = 8.386 \times 10^6 \text{ m/s}$$

$v_{200} > v_0$ e^- ஊடுகிறது ஏற்கனவே உள்ளது அகற்றப்படும்,
 இது ஊடுகிறது v_0

$$\frac{1}{2} m v_0^2 = eV_0$$

$$V_0 = \frac{m v_0^2}{2e} = \frac{9.1 \times 10^{-31} \times 7.229 \times 10^6}{2 \times 1.6 \times 10^{-19}}$$

$$V_0 = 148.6 \text{ V} \quad \text{ஊடுகிறது உள்ளது உள்ளது.}$$

33.

$$I = I_0 \sin \omega t$$

$$I = 77 \sin 314 t$$

$$\frac{I_{\text{rms}}}{I_0} = \frac{77}{\sqrt{2}} = \frac{77}{1.414} = 55 \text{ A.}$$

$$\gamma = \frac{314}{2\pi} = 50 \text{ Hz}$$

$$T = \frac{1}{\gamma} = \frac{1}{50} = 0.02 \text{ s}$$

$$t = 2 \text{ s} \quad i = 77 \sin (628)$$

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PG ASST

GATTSS, PUGALUR.