K. Sakthivel. M.Sc.B.Ed.,

Class : 12

Register Number

COMMON QUARTERLY EXAMINATION - 2024 - 25

PHYSICS

Kallakurichi - PT

Time Allowed : 3.00 Hours] [Max. Marks : 70

PART - I

15x1=15

Choose the correct answer.

1. The speed of light in an isotropic medium depends on,
   (a) Its intensity (b) Its wavelength
   (c) The nature of propagation (d) The motion of the source w.r.t medium
2. 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
3. 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°
4. A step-down transformer reduces the supply voltage from 220 V to 11 V and increase the current from 6 A to100 A. Then its efficiency is
   (a) 1.2 (b) 0.83 (c) 0.12 (d) 0.9
5. Which of the following electromagnetic radiations is used for viewing objects through fog
   a) Microwave (b) Gamma Rays (c) X- Rays (d) Infrared
6. An object is placed is front of a convex mirror of focal length f and the maximum and minimum distance of an object from the mirror such that image formed in real and magnified
   (a) 2f and c (b) c and infinity (c) f and zero (d) None of these
7. 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
8. In a Whetstone's bridge P = 100 Ω, Q = 1000 Ω and R = 40 Ω. If the galvanometer shows zero deflection, then the value of S.
   (a) 1000 Ω (b) 100 Ω (c) 40 Ω (d) 400 Ω
9. A particle having mass m and charge q accelerated through a potential difference V. Find the force experienced when it is kept under perpendicular magnetic field B.
   a) $\sqrt{\frac{2q^3B\,V}{m}}$ b) $\sqrt{\frac{q^3B^2\,V}{2\,m}}$ c) $\sqrt{\frac{2\,q^3B^2\,V}{m}}$ d) $\sqrt{\frac{2\,q^3B\,V}{m^3}}$
10. Fraunhofer lines are an example of ---------- spectrum.
    (a) Line emission (b) Line absorption (c) Band emission (d) Band absorption
11. The equation for an alternating current is given by i = 77 sin 314t. Its frequency is
    (a) 50 Hz (b) 314 Hz (c) 77 Hz (d) 628 Hz
12. Two wires of A and B with circular cross section are made up of the same material with equal lengths. Suppose RA = 3 RB, then what is the ratio of radius of wire A to that of B?
    (a) 3 (b) $\sqrt{3}$ (c) $1/\sqrt{3}$ (d) 1 / 3
13. The magnitude of the magnetic field of a long,strai ght wire carrying a current of 1 A at distance of 1m from it is, $B = \frac{\mu_0 I}{2\pi r}$
    (a) 2×10^{-7} T (b) 2×10^{7} T (c) 1×10^{-7} T (d) 1×10^{7} T
14. The flux linked with a coil at any instant t is given by $\phi_B = 10\,t^2 - 50\,t - 250$. The induced emf at t = 3 s is
    (a) -190 V (b) -10 V (c) 10 V (d) 190 V
15. The temperature coefficient of resistance of a wire is 0.00125 per °C. At 20°C, its resistance is 1Ω. The resistance of the wire will be 2Ω at
    (a) 800°C (b) 700°C (c) 850 °C (d) 820 °C

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PART - II

II. **Note : (i) Answer any 6 of the following questions .** **6x2=12**
(ii) Question No. 24 is compulsory

16. Define Capacitance. Give its Unit
17. What is mean by Electric Field Lines?
18. State Joule's law of heating.
19. Resistance of the material at 20°C and 40°C are 45Ω and 85Ω respectively. Find its temperature Co-efficient of resistivity. $\alpha = \frac{1}{R_0}\frac{\Delta R}{\Delta T}$; $\alpha = \frac{1}{45}\left[\frac{85-45}{40-20}\right] = \frac{1}{45}(2) = 0.044 \text{ per}^\circ C$
20. State Ampere's circuital law.
21. Define RMS value of an alternating current.
22. Give two uses of UV radiation.
23. State law of reflection.
24. A series RLC circuit which resonates at 400 kHz has 80 μH inductor, 2000 pF capacitor and 50 Ω resistor. Calculate the Q – factor of the circuit. Ex: 4.26 $Q = \frac{1}{R}\sqrt{\frac{L}{C}} = \frac{1}{50}\sqrt{\frac{80\times10^{-6}}{2000\times10^{-12}}} = 4$

PART - III

III. **Note :(i) Answer any 6 of the following questions.** **6x3=18**
(ii) Question No.33 is compulsory

25. Derive an expression for Torque experienced by a Dipole Due to a Uniform Electric Field.
26. Derive an expression for Electric Potential for due to a Point charge.
27. Explain the equivalent resistance of a Parallel Resistor Network.
28. How is a Galvanometer converted into a Voltmeter?
29. Mention the various Energy losses in a Transformer.
30. Write down Maxwell Equations in Integral Form.
31. Write the properties of Electromagnetic Waves. **(Any 6 points)**
32. Obtain the relation between focal length (f) and radius of curvature (R) of the Spherical mirror.
33. Suppose a cyclotron is operated to accelerate protons with a magnetic field strength 1 T. Calculate the frequency in which the electrical field between two Dees could be reversed. Ex: 3.23 $f = \frac{qB}{2\pi m_p} = 15.3 \text{ MHz}$
($m_P = 1.67 \times 10^{-27}$ kg, $q = 1.6 \times 10^{-19}$ C)

PART - IV

IV. **Note: (i) Answer all the questions** **5x5=25**

34. (a) Calculate the Electric field due to a Dipole on its Equatorial Plane.
(OR)
(b) Describe the Fizeau's method to determine Speed of Light
35. (a) Explain the Determination of the Internal Resistance of a Cell using Voltmeter.
(OR)
(b) Calculate the Magnetic Field at a Point on the Axial line of a Bar Magnet.
36. (a) Derive the expression for the force on a Current Carrying Conductor in a Magnetic Field.
(OR)
(b) Derive an expression for phase angle between the applied Voltage and Current in Pure Inductive circuit.
37. (a) Show mathematically that the rotation of a coil in a magnetic field over one rotation induces an alternating emf of one cycle.
(OR)
(b) What is Absorption Spectrum? Explain the types of Absorption Spectrum.
38. (a) Using Gauss law, obtain the expression for Electric Field due to an charged Infinite Plane Sheet
(OR)
(b) Describe the Microscopic model of Current and obtain General form of Ohm's law