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பதிவு எண்
Register Number

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PART - III
இயற்பியல் / PHYSICS
(ஆங்கில வழி / **English Version**)

கால அளவு : 3.00 மணி நேரம்]
Time Allowed : 3.00 Hours]

[மொத்த மதிப்பெண்கள் : 70
[Maximum Marks : 70

- அறிவுரைகள் :**
- (1) அனைத்து வினாக்களும் சரியாகப் பதிவாகி உள்ளதா என்பதனைச் சரிபார்த்துக் கொள்ளவும். அச்சுப்பதிவில் குறையிருப்பின், அறைக்கண்காணிப்பாளரிடம் உடனடியாகத் தெரிவிக்கவும்.
- (2) **நீலம்** அல்லது **கருப்பு** மையினை மட்டுமே எழுதுவதற்கும் அடக்கோடிடுவதற்கும் பயன்படுத்த வேண்டும். படங்கள் வரைவதற்கு பென்சில் பயன்படுத்தவும்.

- Instructions :**
- (1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.
- (2) Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

பகுதி - I / **PART - I**

- குறிப்பு :**
- (i) **அனைத்து** வினாக்களுக்கும் விடையளிக்கவும். **15x1=15**
- (ii) கொடுக்கப்பட்டுள்ள **நான்கு** மாற்று விடைகளில் மிகவும் ஏற்புடைய விடையைத் தேர்ந்தெடுத்துக் குறியீட்டுடன் விடையினையும் சேர்த்து எழுதவும்.

- Note :**
- (i) Answer **all** the questions.
- (ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

- Point charges $1 \mu\text{C}$ and $6 \mu\text{C}$ are placed in air at a certain distance apart. The magnitude of the force on $1 \mu\text{C}$ by $6 \mu\text{C}$ is F_1 . The magnitude of the force on $6 \mu\text{C}$ by $1 \mu\text{C}$ F_2 . Then $F_1 : F_2$ is :
(a) 1 : 1 (b) 36 : 1 (c) 1 : 6 (d) 6 : 1
- In Joule's heating law, when R and t are constant, if H is taken along the Y-axis and I^2 along the X-axis, the graph is a :
(a) straight line (b) parabola (c) circle (d) ellipse
- Q factor is equal to _____.

- (a) $\frac{\omega r L}{R}$ (b) $\frac{1}{R} \sqrt{\frac{L}{C}}$ (c) $\frac{X_L}{R}$ (d) All the above

[திருப்புக / **Turn Over**

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4. For light incident from air on a slab of refractive index 2, the maximum possible angle of refraction is :
- (a) 60° (b) 30° (c) 90° (d) 45°
5. Phosphor-bronze wire is used for suspension in a moving coil galvanometer, because it has:
- (a) large couple per unit twist (b) small couple per unit twist
(c) high conductivity (d) high resistivity
6. The potential at a point due to charge of 5×10^{-7} C located 10 cm away is
- (a) 3.5×10^5 V (b) 3.5×10^4 V (c) 4.5×10^4 V (d) 4.5×10^5 V
7. An electromagnetic wave is propagating in a medium with a velocity $\vec{v} = v\vec{i}$. The instantaneous oscillating electric field of this e.m. wave is along +Y-axis, then the direction of oscillating magnetic field of the electromagnetic wave will be along:
- (a) +Z direction (b) -Y direction (c) -Z direction (d) -X direction
8. Two wires of A and B with circular cross section are made up of the same material with equal lengths. Suppose $R_A = 3 R_B$, 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) $\frac{1}{3}$
9. In a series RL circuit, the resistance and inductive reactance are the same. Then the phase difference between the voltage and current in the circuit is
- (a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) zero (d) $\frac{\pi}{2}$
10. If the velocity and wavelength of light in air is V_a and λ_a and that in water is V_w and λ_w , then the refractive index of water is,
- (a) $\frac{\lambda_w}{\lambda_a}$ (b) $\frac{V_w}{V_a}$ (c) $\frac{V_a \lambda_a}{V_w \lambda_w}$ (d) $\frac{V_a}{V_w}$
11. 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°
12. If the magnitude of the magnetic field is 10^{-6} T, then magnitude of the electric field for a electromagnetic waves is
- (a) 600 Vm^{-1} (b) 100 Vm^{-1} (c) 900 Vm^{-1} (d) 300 Vm^{-1}
13. A cyclotron is operated at an oscillator frequency of 12 MHz and has a dee radius 50 cm. What is the magnitude of the magnetic field needed for a proton to be accelerated in the cyclotron?
- (a) 0.78 T (b) 0.65 T (c) 0.39 T (d) 0.12 T

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14. A circular coil of radius 5 cm and 50 turns carries a current of 3 amperes. The magnetic dipole moment of the coil is nearly
 (a) 1.0 Am^2 (b) 1.2 Am^2 (c) 0.5 Am^2 (d) 0.8 Am^2
15. When a positively charged particle enters a uniform magnetic field with uniform velocity, its trajectory can be i) a straight line ii) a circle iii) a helix
 (a) i only (b) i or ii (c) i or iii (d) any one of i, ii and iii

PART - II

Note : Answer **any six** questions. Question No. **24** is **compulsory**.

6x2=12

16. Why does sky appear blue?
17. What are the uses of X-rays?
18. An ideal transformer has 460 and 40,000 turns in the primary and secondary coils respectively. Find the voltage developed per turn of the secondary coil if the transformer is connected to a 230 V AC main.
19. State Ampere's Circuital Law.
20. Define 'electric field'.
21. Define ampere in terms of force.
22. If the focal length is 150 cm for a glass lens, what is the power of the lens?
23. How will you increase the current sensitivity of a galvanometer?
24. If the resistance of coil is 3Ω at 20°C and $\alpha = 0.004/^\circ\text{C}$, then, determine its resistance at 100°C .

PART - III

Note : Answer **any six** questions. Question No. **33** is **compulsory**.

6x3=18

25. What is optical path? Write down the equation for optical path and mention what each term represents.
26. Write the special features of Magnetic Lorentz force.
27. Derive the relation between f and R for a spherical mirror.
28. Obtain a relation between current and drift velocity.
29. What are Fraunhofer lines? How are they useful in the identification of elements present in the Sun?
30. Derive the equation for inductance of a solenoid. Assume that the length of the solenoid is greater than its diameter.

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31. The resistance of a nichrome wire at 0°C is 10Ω . If its temperature coefficient of resistance is $0.004/^{\circ}\text{C}$, find its resistance at boiling point of water. Comment on the result.
32. Derive an expression for electrostatic potential due to a point charge.
33. A coil of a tangent galvanometer of diameter 0.24 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° .

PART – IV**Note** : Answer **all** the questions.**5x5=25**

34. (a) (i) State Coulomb's Law in electrostatics
(ii) State the differences between Coulomb force and Gravitational force.

OR

- (b) Derive an expression for electric field intensity due to an electric dipole at a point on its axial line.

35. (a) Describe the microscopic model of current and obtain microscopic form of Ohm's Law.

OR

- (b) Explain the determination of unknown resistance using metre bridge.

36. (a) Calculate the magnetic field produced at a point along the axis of the current carrying circular coil. Write down the equation of the magnetic field at the centre of the coil using Biot-Savar law.

OR

- (b) Discuss the working of Cyclotron in detail.

37. (a) Deduce the expression for the force between two long parallel current carrying conductors.

OR

- (b) Explain the construction and working of transformer.

38. (a) Explain the Maxwell's modifications of Ampere's circuit law.

OR

- (b) Describe the Fizeau's method to determine the speed of light.

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