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PART – III

, awgpay / PHYSICS

(English Version)

Time Allowed : 3.00 Hours] **[Maximum Marks : 70**

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.

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. In an oscillating LC circuit, the maximum charge on the capacitor is Q. the charge on the capacitor when the energy is stored equally between the electric and magnetic field is:

(a) $\frac{Q}{\sqrt{2}}$ (b) $\frac{Q}{2}$ (c) Q (d) $\frac{Q}{\sqrt{3}}$

2. In a Young's double slit experiment, the slit separation is doubled. To maintain the same fringe spacing on the screen, the screen-to-slit distance D must be changed to:

(a) $\sqrt{2}$ D (b) 2D (c) $\frac{D}{\sqrt{2}}$ (d) $\frac{D}{2}$

3. Which charge configuration produces a uniform electric field?

(a) Uniformly charged infinite plate (b) point charge

(c) Uniformly charged spherical shell (d) Uniformly charged infinite line

4. The ratio of magnetic length and geometrical length is :

(a) 0.833 (b) 0.633 (c) 0.933 (d) 0.733

5. The internal resistance of a 2.1 V cell which gives a current of 0.2A through a resistance of 10 Ω is :

(a) 0.8 Ω (b) 0.2 Ω (c) 1.0 Ω (d) 0.5 Ω

6. If the nuclear radius of ^{27}Al is 3.6 fermi, the approximate nuclear radius of ^{64}Cu in fermi is:

(a) 4.8 (b) 2.4 (c) 3.6 (d) 1.2

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7. 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) $\frac{V_a}{V_w}$

8. The unit of electric flux is :

(a) $Nm^{-1}C^2$ (b) $Nm^{-2}C^{-1}$ (c) Nm^2C^{-1} (d) N^2mC^{-1}

9. For a healthy eye, the distance of the near point is _____

(a) 30 cm (b) 20 cm (c) 35 cm (d) 25 cm

10. The blueprint for making ultra-durable synthetic material is mimicked from:

(a) Parrot fist (b) Lotus leaf

(c) Peacock feather (d) Morpho butterfly

11. Emission of electrons by the absorption of heat energy is called _____

(a) Thermionic (b) Photoelectric

(c) Secondary (d) Filed

12. The Zener diode is primarily used as :

(a) Oscillator (b) Rectifier (c) Voltage regulator (d) Amplifier

13. Which of the following is false for electromagnetic waves?

(a) longitudinal (b) transverse

(c) produced by accelerating charges (d) non-mechanical waves

14. 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 $\vec{B}$.

(a) $\sqrt{\frac{2q^3B^2V}{m}}$ (b) $\sqrt{\frac{2q^3BV}{m}}$ (c) $\sqrt{\frac{2q^3BV}{m^3}}$ (d) $\sqrt{\frac{q^3B^2V}{2m}}$

15. In a transformer, the number of turns in the primary and the secondary are 410 and 1230 respectively. If the current in primary is 6 A, then that in the secondary coil is :

(a) 12 A (b) 2 A (c) 1 A (d) 18 A

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PART – II

Note : Answer **any six** questions. Question No. **24** is **compulsory.** 6x2=12

16. Mention the ways of producing induced emf.
17. Find the Polarizing angle for glass of refractive index 1.5
18. What is Peltier effect?
19. Define "Electrostatic Potential".
20. How will you define threshold frequency?
21. State Ampere's Circuital Law.
22. Why does sky appear blue?
23. Give two uses of IR radiation.
24. Dielectric strength of air is 4×10^6 Vm^{-1}. Suppose the radius of a hollow sphere in the Van de Graaff generator is R = 0.4 m, calculate the maximum potential difference created by this Van de Graaff generator.

PART – III

Note : Answer **any six** questions. Question No. **33** is **compulsory.** 6x3=18

25. State Kirchhoff's current and voltage rule.
26. What are critical angle and total internal reflection?
27. List out the characteristics of Photons.
28. Obtain the expression for energy stored in the parallel plate capacitor.
29. Mention the differences between interference and diffraction.
30. 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.
31. Draw the circuit diagram of a full wave rectifier and draw its input and output waveforms.
32. Mention the various energy losses in a transformer.
33. 92U235 nucleus emits 2α particles, 3β particles and 2γ particles. What is the resulting atomic number and mass number?

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PART – IV

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

34. (a) Deduce the relation for the magnetic field at a point due to an infinitely long straight conductor carrying current.

(OR)

(b) Obtain the law of radioactivity.

35. (a) Calculate the electric filed due to a dipole on its axial line.

(OR)

(b) What is Frequency Modulation? List out the advantages and limitations of frequency modulation.

36. (a) (i) Derive an expression for de-Broglie wavelength of electrons.

(ii) Calculate the momentum of an electron with kinetic energy 2 eV.

(OR)

(b) Write down Maxwell equations in integral from.

37. (a) Explain about Astronomical telescope and obtain the equation for the magnification.

(OR)

(b) (i) Explain the equivalent resistance of a series resistor network.

(ii) A copper wire of cross-sectional area 0.5 mm^2 carries a current of 0.2 A. If the free electron density of copper is 8.4×10^{28} m^{-3} then compute the drift velocity of free electrons.

38. (a) Obtain Lens maker's formula.

(OR)

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

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