

12 RRegister No. **Half Yearly Examination- 2024**

Time : 3.00 Hrs.

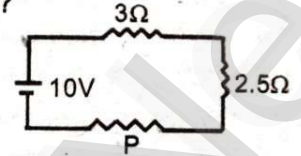
PHYSICS

Marks : 70

PART - I

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. **15 x 1 = 15**

1. There is a current of 1.0A in the circuit show below. What is the resistance of P?
a) 3.5 Ω b) 1.5 Ω c) 4.5 Ω d) 2.5 Ω



2. In an hydrogen atom, the electron revolving in the second orbit, has angular momentum
a) $\frac{4h}{\pi}$ b) h c) $\frac{2h}{\pi}$ d) $\frac{h}{\pi}$
3. An electric field $\vec{E} = 10x\hat{i}$ exists in a certain region of space. Then the potential difference $V = V_0 - V_A$, where V_0 is the potential of the origin and V_A is the potential at $x = 2\text{m}$ is
a) 10V b) -20V c) +20V d) -10V
4. The temperature coefficient of resistance of a wire is 0.00125 per $^\circ\text{C}$. 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
5. 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°
6. $\frac{20}{\pi^2}$ H inductor is connected to a capacitor of capacitance C, The value of C in order to impart maximum power at 50 Hz is a) 50 μF b) 0.5 μF c) 500 μF d) 5 μF
7. An e.m wave is propagating in a medium with a velocity $\vec{v} = v\hat{i}$. The instantaneous oscillating electric field of this e.m wave is along +y axis, then the direction of oscillating magnetic field of the e.m. wave will be along a) -y direction b) -x direction c) +z direction d) -z direction
8. The radius of curvature of curved surface at a thin plano convex lens is 10cm and the refractive index is 1.5 if the plane surface is silvered, then the focal length will be a) 5cm b) 10cm c) 15cm d) 20cm
9. First diffraction minimum due to a single slit of width 1.0×10^{-5} cm is at 30° . Then wavelength of light used is, a) 400A° b) 500A° c) 600A° d) 700A°
10. In an electron microscope, the electron are accelerated by a voltage of 14KV, if the voltage is changed to 224 KV then the de-Broglie wavelength associated with the electron would
a) increase by 2 times b) decrease by 2 times c) decrease by 4 times d) increase by 4 times
11. The ratio of the wavelength radiation emitted for the transition from $n = 2$ to $n = 1$ in Li^{++} , He^+ and H is
a) 1 : 2 : 3 b) 1 : 4 : 9 c) 3 : 2 : 1 d) 4 : 9 : 36
12. If a positive half-wave rectified voltage is fed to a load resistor, for which part of a cycle there will be current flow through the load? a) $0^\circ - 90^\circ$ b) $90^\circ - 180^\circ$ c) $0^\circ - 180^\circ$ d) $0^\circ - 360^\circ$
13. "Ski Wax" is an application of nano product in the field of.....
a) medicine b) textile c) sports d) automotive industry
14. RMS voltage and frequency of $V = 230 \sin(314t)$. A.C source
a) 162.6V, 50Hz b) 230V, 50 Hz c) 230 Vm, 60 Hz d) 162.6 V, 25 Hz
15. If \vec{E} and \vec{B} are the electric and magnetic field vectors of em waves then the direction of propagation of e.m. wave is along the direction of a) \vec{E} b) \vec{B} c) $\vec{E} \times \vec{B}$ d) None of these

PART - II**Note : Answer any six questions. (Question No.24 is compulsory)****6 x 2 = 12**

16. Write down Coulomb's law in vector form and mention what each term represents.
17. Write down the various forms of expression for power in electrical circuit.
18. What is magnetic susceptibility?
19. A coil of 200 turns : carries a current of 0.4 A. If the magnetic flux of 4 mwb is linked with each turn of the coil, find the inductance of the coil.
20. Why do stars twinkle?
21. Define wavefront.
22. Why we do not see the wave properties of a baseball.
23. What do you mean by doping?
24. In a nuclear fission 0.1% mass is converted into energy. Calculate the energy released by the fission of 1kg mass.

PART - III**Note : Answer any six questions. (Question No.33 is compulsory)****6 x 3 = 18**

25. Give any two examples for "Nano" in nature.
26. Distinguish between intrinsic and extrinsic semiconductors.
27. Give the symbolic representation of alpha, beta decay and gamma emission.
28. List out the laws of photoelectric effect.
29. Light of wavelength of 5000\AA produces diffraction pattern of the single slit of width $2.5\ \mu\text{m}$. What is the maximum order of diffraction possible.
30. Derive the relation between f and R for a spherical mirror.
31. What are Fraunhofer lines? How are they useful in the identification of elements present in the sun.
32. Why does the voltage sensitivity remains constant even if the number of turns is increased?
33. A copper wire of $10^{-6}\ \text{m}^2$ area of cross section, carries a current of 2A. If the number of free electrons per cubic meter in the wire is 8×10^{28} , calculate the current density and average drift velocity of electrons.

PART - IV**Note : Answer all the questions.****5 x 5 = 25**

34. Obtain lens maker's formula and mention its significance.
(OR)
Obtain the expression for electric field due to an infinitely long charged wire.
35. Deduce the relation for the magnetic field at a point due to an infinitely long straight conductor carrying current using Biot-Savart law.
(OR)
Obtain the condition for bridge balance in Wheatstone's bridge.
36. Obtain the equation for bandwidth in Young's double slit experiment.
(OR)
Explain the construction and working of transformer.
37. Obtain Einstein's photoelectric equation with necessary explanation.
(OR)
Explain the types of emission spectrum.
38. Obtain the law of radioactivity?
(OR)
Draw the circuit diagram of a half wave rectifier and explain its working.