Vellore

COMMON HALF YEARLY EXAMINATION - 2024

♦   **Standard XII**   Reg.No. ☐☐☐☐☐☐

PHYSICS

Time : 3.00 hrs   Marks : 70
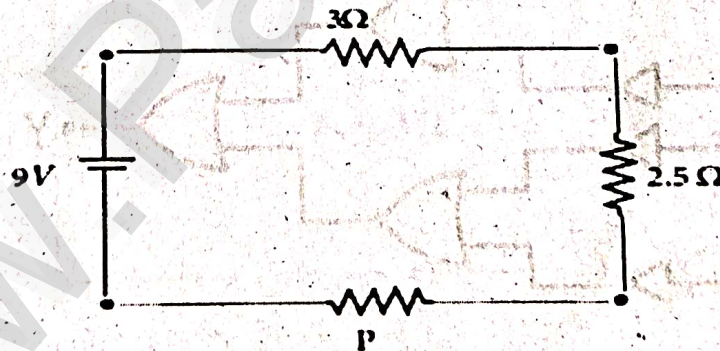
Part - A

I. Choose the correct answer: 15 × 1 = 15

1. If voltage applied on a capacitor is increased from V to 2V, choose the correct conclusion.
   a) Q remains the same, C is doubled   b) Q is doubled, C doubled
   c) C remains same, Q doubled   d) Both Q and C remain same

2. The threshold wavelength for a metal surface whose photoelectric work function is 3.313 eV is
   a) 4125 Å   b) 3750 Å   c) 6000 Å   d) 20625 Å

3. The zener diode is primarily used as
   a) Rectifier   b) Amplifier   c) Oscillator   d) Voltage regulator

4. A radioactive nucleus (initial mass number A and atomic number Z) emits two α-particles and 2 positrons. The ratio of number of neutrons to that of proton in the final nucleus will be

   a) $\dfrac{A-Z-4}{Z-6}$ b) $\dfrac{A-Z-4}{Z-2}$ c) $\dfrac{A-Z-12}{Z-4}$ d) $\dfrac{A-Z-2}{Z-6}$

5. The number of electrons in one coulomb of negative charge are
   a) 6.25×10^{-18} electrons   b) 6.25×10^{20} electrons
   c) 6.25×10^{25} electrons   d) 6.25×10^{18} electrons

6. There is a current of 1.0 A in the circuit shown below. What is the resistance of P ?

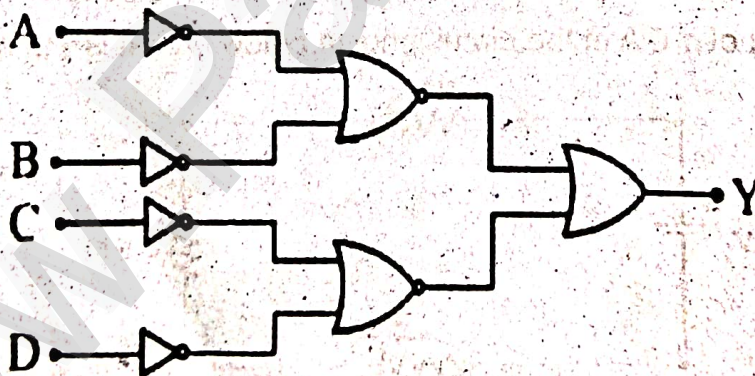   a) 1.5 Ω   b) 2.5 Ω   c) 3.5 Ω   d) 4.5 Ω

7. A wire of length l carrying a current I along the Y direction is kept in a magnetic field given by $\vec{B} = \dfrac{\beta}{\sqrt{3}}\left(\hat{i} + \hat{j} + \hat{k}\right)$ T. The magnitude of Lorentz force acting on the wire is

   a) $\sqrt{\dfrac{2}{3}}\,\beta I l$ b) $\sqrt{\dfrac{1}{3}}\,\beta I l$ c) $\sqrt{\dfrac{1}{2}}\,\beta I l$ d) $\sqrt{2}\,\beta I l$

8. Light transmitted by Nicol prism is,
   a) partially polarised
   b) unpolarised
   c) plane polarised
   d) elliptically polarized

9. The radius of the 10th orbit of hydrogen atom is 52.9 Å. Calculate the de broglie wavelength of the electron orbitting in the 10th orbit.
   a) 16.64 Å
   b) 3.322 Å
   c) 33.22 Å
   d) 6.64 Å

10. The instantaneous values of alternating current and voltage in a circuit are $i = \frac{1}{\sqrt{2}} \sin(100\pi t) A$ and $V = \frac{1}{\sqrt{2}} \sin\left(100\pi t + \frac{\pi}{3}\right) V$. The average power in watts consumed in the circuit is
   a) $\frac{1}{4}$
   b) $\frac{\sqrt{3}}{4}$
   c) $\frac{1}{2}$
   d) $\frac{1}{8}$

11. Electromagnetic waves travel in a medium which has relative permeability 2.0 and relative permittivity 2.0. Then the speed of the electromagnetic wave in the medium will be
   a) 3.6×10^8 m/s
   b) 3×10^8 m/s
   c) 1.5×10^8 m/s
   d) 1.5×10^2 m/s

12. The particle which gives mass to protons and neutrons are
   a) Higgs particle
   b) Einstein particle
   c) Nanoparticle
   d) Bulk particle

13. For the given logic circuit, the output will be 1 under which of the following conditions?
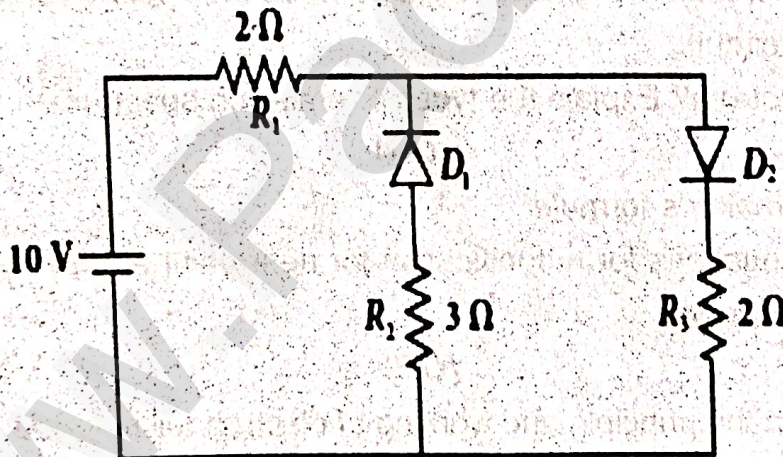

   a) A = 0, B = 0, C = 1, D = 0
   b) A = 1, B = 0, C = 1, D=0
   c) A = 0, B = 1, C = 0, D = 1
   d) A = 0, B = 1, C = 1, D = 1

14. 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

15. When a metallic surface is illuminated with radiation of wavelength λ, the stopping potential is V. If the same surface is illuminated with radiation of wavelength 2λ, the stopping potential is $\frac{V}{4}$. The threshold wavelength for the metallic surface is

a) $\frac{5}{2}\lambda$ b) 4λ c) 5λ d) 3λ

Part - B

II. Answer any 6 questions. (Q.No.24 is compulsory) $6 \times 2 = 12$

16. What is corona discharge?

17. If the resistance of coil is 3 Ω at 20°C and $\alpha = 0.004$/°C then determine its resistance at 100°C.

18. State Flemming's left hand rule.

19. Mention the ways of producing induced emf.

20. Write the properties of cathode rays.

21. Define work function of a metal. Give its unit.

22. The angle of minimum deviation for an equilateral prism is 37°. Find the refractive index of the material of the prism.

23. The given circuit has two ideal diodes connected as shown in figure below. Calculate the current flowing through the resistance R_1.

24. Compute the speed of the electromagnetic wave in a medium if the amplitude of electric and magnetic fields are 3×10^4 N C^{-1} and 2×10^{-4} T, respectively.

Part - C

III. Answer any 6 questions. (Q.No.33 is compulsory) $6 \times 3 = 18$

25. Write the uses of the capacitors.

26. Explain the equivalent resistance of a parallel resistor network.

27. How is a galvanometer converted into
    (i) an ammeter and (ii) a voltmeter? Draw respective diagrams.

28. Write down the properties of electromagnetic waves.

29. An object is placed at a certain distance from a convex lens of focal length 20 cm. Find the object distance if the image obtained is magnified 4 times.

30. Differentiate between Fresnel and Fraunhofer diffraction.

31. List out the laws of photoelectric effect.

32. The self-inductance of an air-core solenoid is 4.8 mH. If its core is replaced by iron core, then its selfinductance becomes 1.8 H. Find out the relative permeability of iron.

33. Find the ratio of minimum to maximum wavelength in Balmer series.

Part - D

IV. Answer all the questions.   5 x 5 = 25

34. a) Derive an expression for electrostatic potential due to an electric dipole.

    (OR)

    b) Derive the expression for the force on a current-carrying conductor in a magnetic field.

35. a) Obtain the condition for bridge balance in Wheatstone's bridge.

    (OR)

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

36. a) What is Spectrum? Explain the types of emission spectrum.

    (OR)

    b) Obtain lens maker's formula.

37. a) Obtain the equations for magnification for near point and normal focusing of the simple microscope.

    (OR)

    b) Briefly explain the principle and working of electron microscope.

38. a) Discuss the Millikan's oil drop experiment to determine the charge of an electron.

    (OR)

    b) Explain the construction and working of a full wave rectifier.

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