

HALF YEARLY EXAMINATION – 2023

12 - STD

PHYSICS

TIME : 3 HOURS

MARKS : 70

PART – I

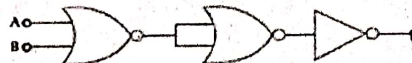
Note : (i) Answer all the questions. (ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

15 x 1 = 15

- 1) If the input to the NOT gate is $A = 0011$, its output is
 (a) 0100 (b) 1000 (c) 1100 (d) 0011
- 2) The nucleus is approximately spherical in shape. Then the surface area of nucleus having mass number A varies as
 (a) $A^{2/3}$ (b) $A^{4/3}$ (c) $A^{1/3}$ (d) $A^{5/3}$
- 3) The alloys used for muscle wires in Robots are
 (a) Shape memory alloys (b) Gold copper alloys (c) Gold silver alloys (d) Two dimensional alloys
- 4) In photoelectric emission, a radiation whose frequency is 4 times threshold frequency of a certain metal is incident on the metal. Then the maximum possible velocity of the emitted electron will be
 (a) $\sqrt{\frac{hv_0}{m}}$ (b) $\sqrt{\frac{6hv_0}{m}}$ (c) $2\sqrt{\frac{hv_0}{m}}$ (d) $\sqrt{\frac{hv_0}{2m}}$
- 5) A plane glass is placed over a various coloured letters (violet, green, yellow, red) The letter which appears to be raised more is,
 (a) red (b) yellow (c) green (d) violet
- 6) A Parallel plate capacitor stores a charge Q at a voltage V . Suppose the area of the parallel plate capacitor and the distance between the plates are each doubled then which is the quantity that will change?
 (a) capacitance (b) charge (c) voltage (d) energy density
- 7) An electric dipole is placed at an alignment angle of 30° with an electric field of $2 \times 10^5 \text{ NC}^{-1}$. It experiences a torque equal to 4 N m. The charge on the dipole if the dipole length is 1 cm is
 (a) 4 mC (b) 8 mC (c) 5 mC (d) 7 mC
- 8) In India electricity is supplied for domestic use at 220 V. It is supplied at 110 V in USA. If the resistance of a 60W bulb for use in India is R , the resistance of a 60W bulb for use in USA will be
 (a) R (b) $2R$ (c) $\frac{R}{4}$ (d) $\frac{R}{2}$
- 9) The internal resistance of a 2.0 V cell which gives a current of 0.1 A through a resistance of 10Ω is
 (a) 0.2Ω (b) 0.5Ω (c) 0.8Ω (d) 10Ω
- 10) The electric and magnetic fields of an electromagnetic wave are
 (a) in phase and perpendicular to each other (b) out of phase and not perpendicular to each other (c) in phase and not perpendicular to each other (d) out of phase and perpendicular to each other
- 11) The radius of curvature of curved surface at a thin Plano convex lens is 10 cm and the refractive index is 1.5. If the plane surface is silvered, then the focal length will be,
 (a) 5 cm (b) 10 cm (c) 15 cm (d) 20 cm
- 12) When the current changes from +2A to -2A in 0.05s, an emf of 8 V is induced in a coil. The coefficient of self-induction of the coil is
 (a) 0.2 H (b) 0.4 H (c) 0.8 H (d) 0.1 H
- 13) A circular coil of radius 5 cm and 50 turns carries a current of 3 ampere. The magnetic dipole moment of the coil is nearly
 (a) 1.0 amp m^2 (b) 1.2 amp m^2 (c) 0.5 amp m^2 (d) 0.8 amp m^2
- 14) In a hydrogen atom, the electron revolving in the second orbit, has angular momentum equal to
 (a) h (b) $\frac{h}{\pi}$ (c) $\frac{4h}{\pi}$ (d) $\frac{2h}{\pi}$

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15) The given electrical network is equivalent to



(a) AND gate

(b) OR gate

(c) NOR gate

(d) NOT gate

PART B

Answer any SIX questions in which Question No. 23 is compulsory.

6 X 2 = 12

16. Why is it safer to be inside a car than standing under a tree during lightning?
17. Define temperature co-efficient of resistivity.
18. State Fleming's right hand rule.
19. Give any two uses of IR radiation.
20. What is principle of reversibility?
21. Differentiate interference and diffraction.
22. What is photoelectric effect?
23. Calculate the number of nuclei of Carbon-14 undecayed after 22,920 years, if the initial number of Carbon-14 atoms is 10,000. (The half-life of Carbon-14 is 5730 years)
24. Draw the circuit diagram for Common Base configuration.

PART C

Answer any SIX questions in which Question No. 28 is compulsory.

6 X 3 = 18

25. Derive an expression for torque experienced by an electric dipole placed in the uniform electric field.
26. Find the equivalent resistance of a parallel resistor network.
27. Explain magnetic Lorentz force.
28. Find the impedance of a series RLC circuit if the inductive reactance, capacitive reactance and resistance are 184Ω , 144Ω and 30Ω respectively. Also calculate the phase angle between voltage and current.
29. Explain the types of emission spectra.
30. Write short note on Nicol prism.
31. Derive an expression of de Broglie wavelength of electrons.
32. Explain Alpha decay, beta decay and gamma emission.
33. Write the advantages and limitations of frequency modulation.

PART D

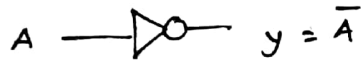
Answer all Questions:

5 x 5 = 25

34. A) Obtain a force between two long parallel current carrying conductors.
(OR)
B) Explain the spectral series of an hydrogen atom.
35. A) Discuss about simple microscope and obtain equation for magnification.
(OR)
B) Draw the circuit diagram of a full wave rectifier and explain its working.
36. A) How the emf of two cells are compared using potentiometer?
(OR)
B) (i) Derive the relation between f and R for a spherical mirror. (3 mark)
(ii) A monochromatic light is incident on an equilateral prism at an angle 30° and is emergent at an angle of 75° . What is the angle of deviation produced by the prism? (2 mark)
37. A) Obtain an expression for electric field due to an infinitely long charged wire.
(OR)
B) Obtain Einstein's photoelectric equation with necessary explanation.
38. A) How will you induce an emf by changing the orientation of the coil with respect to magnetic field.
(OR)
B) Write down Maxwell equations in integral form.

HALF YEARLY EXAM - 2023PHYSICSANSWER KEY

1. NOT gate $A = 0011$



Output : 1100

2. (a) $A^{2/3}$

3. (a) Shape memory alloys

4. (b) $\sqrt{\frac{6h\nu_0}{m}}$

$$K_{\max} = h\nu - h\nu_0$$

$$\frac{1}{2} m v_{\max}^2 = 4h\nu_0 - h\nu_0$$

$$v_{\max}^2 = \frac{6h\nu_0}{m} \quad (v = 4\nu_0)$$

$$v_{\max} = \sqrt{\frac{6h\nu_0}{m}}$$

5. (d) Violet

6. (d) energy density

7. (a) 4 mC

$$\tau = PE \sin\theta$$

$$\tau = q \times 2l \times E \sin\theta$$

$$q = \frac{\tau}{2l \times E \sin\theta}$$

$$q = \frac{4}{10^{-2} \times 2 \times 10^5 \times 0.5}$$

$$q = 4 \times 10^{-3} \text{ C}$$

(or)

$$q = 4 \text{ mC}$$

8. (c) $\frac{R}{4}$

India $P = \frac{V^2}{R}$

$$P = \frac{220 \times 220}{60} = R$$

USA $P = \frac{110 \times 110}{60} = R'$

$$\frac{R}{R'} = \frac{220 \times 220}{60} \times \frac{60}{110 \times 110}$$

$$\frac{R}{R'} = 4$$

$$R' = \frac{R}{4} //$$

9. (d) 10 Ω

$$I = \frac{\mathcal{E}}{R+Y} \quad (\text{or}) \quad \mathcal{E} = \frac{E}{I} - R$$

$$\mathcal{E} = \left(\frac{2}{10^{-1}} - 10 \right)$$

$$\mathcal{E} = 20 - 10$$

$$\mathcal{E} = 10 \Omega$$

10. (a) In phase and perpendicular to each other

11. (b) 10 cm

$$f = \frac{R}{2(\mu-1)}$$

$$f = \frac{10}{2(1.5-1)}$$

$$f = 10 \text{ cm.}$$

12. (d) 0.1 H

$$e = -L \frac{di}{dt}$$

$$e = -L \frac{I_2 - I_1}{dt}$$

$$8 = -L \frac{(-2 - 2)}{0.05}$$

$$\frac{2}{8} = \frac{L}{5 \times 10^{-2}}$$

$$L = 10 \times 10^{-2} \text{ H}$$

(or)

$$L = 0.1 \text{ H}$$

13. (b) 1.2 amp m²

$$M = N \times I \times A$$

$$M = N I \pi r^2$$

$$M = 50 \times 3 \times 3.14 \times (5 \times 10^{-2})^2$$

$$M = 11775 \times 10^{-4}$$

$$M = 1.1775 \text{ A m}^2$$

(or)

$$M = 1.2 \text{ A m}^2$$

14. (b) $\frac{h}{\pi}$

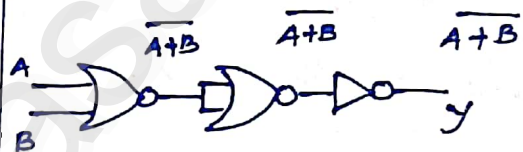
Angular momentum

$$L = \frac{n h}{2\pi} \quad (\because n=2)$$

$$L = \frac{2 h}{2\pi}$$

15.

(c) NOR gate



$$y = \overline{A+B}$$

NOR gate.

P. Kathiravan Msc., B.ed.,

P.G. Assit physics

C.E.O.A Matric. HR. sec

School melur

Madurai -

Contact: 9965484608