



Roll No. \_\_\_\_\_

HSSC-(P-II)-A-2024  
(For All Sessions)

Paper Code

8

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7

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**Physics (Objective)****(GROUP-I)****Time: 20 Minutes****Marks : 17**

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1 One henry is equal to:

- (A)  $V S^{-1} A^{-1}$  (B)  $V S A^{-1}$  (C)  $V S^{-1} A$  (D)  $V^{-1} S A$

2. When motor is overloaded, the magnitude of back *emf* is:

- (A) Constant (B) Increases (C) Decreases (D) Infinite

3. In capacitor circuit phase between current and charge is:

- (A) Parallel (B) In phase (C) Anti parallel (D) Out of phase

4. At resonance frequency the impedance of *RLC* series circuit is:

- (A) Minimum (B) Maximum (C) Both (A) and (B) (D) Infinite

5. Which has least hysteresis loop area?

- (A) Soft iron (B) Steel (C) Wrought iron (D) Cobalt

6. During negative half cycle of A.C., *p-n* junction has:

- (A) Low resistance (B) No resistance (C) High resistance (D) Remain same

7. Device which converts low voltage or current to high voltage or current is:

- (A) Rectifier (B) Transformer (C) Inductor (D) Amplifier

8. The momentum of photon is represented by the equation:

- (A)  $p = mv$  (B)  $p = \frac{h}{\lambda}$  (C)  $p = \frac{\lambda}{h}$  (D)  $p = h\lambda$

9. The energy needed by photon to create electron-positron pair is:

- (A)  $1.02 \text{ MeV}$  (B)  $0.52 \text{ MeV}$  (C)  $0.051 \text{ MeV}$  (D)  $1.51 \text{ MeV}$

10. Bremsstrahlung radiations are example of:

- (A) Molecular spectra (B) Atomic spectra (C) Continuous spectra (D) Discrete spectra

11. 1 rem is equal to:

- (A)  $0.1 \text{ SV}$  (B)  $0.01 \text{ SV}$  (C)  $2.04 \text{ SV}$  (D)  $3.06 \text{ SV}$

12. Radiotherapy is generally done with  $\gamma$ -rays emitted from:

- (A) Iodine-131 (B) Strontium-90 (C) Sodium-24 (D) Cobalt-60

13. Charge on the Droplet can be calculated by:

- (A)  $q = \frac{mg}{vd}$  (B)  $q = \frac{v}{mgd}$  (C)  $q = \frac{mgd}{v}$  (D)  $q = \frac{d}{mgd}$

14. If the distance between two charges is halved, Force becomes:

- (A) One fourth (B) Four times (C) Half (D) Double

15. The minimum power is delivered to across the resistor *R*, when:

- (A)  $r = \infty$  (B)  $r = 0$  (C)  $r = R$  (D)  $r = R/4$

16. A positive charge is moving away from observer. Direction of magnetic induction will be:

- (A) Anticlockwise (B) Towards right (C) Towards left (D) Clockwise

17. Shunt resistance is:

- (A) Low resistance (B) High resistance (C) Zero resistance (D) Impedence

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**Physics (Subjective)****SECTION-I**

RWP-1-24

2. Write short answers of any eight parts from the following:

(8x2=16)

- i. Define electric polarization and electric dipole.
- ii. Sketch the graphs for charging and discharging of a capacitor.
- iii. The potential is constant throughout a given region of space. Is the electric field zero or non-zero in this region? Explain
- iv. How can you identify that which plate of a capacitor is positively charged?
- v. Can an electron at rest be set in motion with a magnet? Explain.
- vi. How does the graph pattern appear stationary on the screen of CRO? Explain the condition.
- vii. What should be the orientation of a current carrying coil in a magnetic field so that torque acting upon the coil is (a) maximum (b) minimum?
- viii. Why the voltmeter should have a very high resistance? ix. What factors make a fusion reaction difficult to achieve?
- x. What information is revealed by the length and shape of the tracks of an incident particle in Wilson cloud chamber?
- xi. What is meant by dose of radiation? What is its S.I. unit? xii. Why Geiger counter is not suitable for fast counting?

3. Write short answers of any eight parts from the following:

(8x2=16)

- i. Why does the resistance of a conductor rise with temperature? ii. What is meant by A.M. and F.M.?
- iii. Describe a circuit which will give a continuously varying potential.
- iv. Why potentiometer is a better instrument than a voltmeter to measure potential difference? Explain briefly.
- v. In an R.L circuit, will the current lag or lead the voltage? Illustrate your answer by a vector diagram.
- vi. When a 100v are applied to an A.C. circuit, the current flowing in it is 100mA. Find its impedance.
- vii. What is meant by para, dia and ferromagnetic substance? Give examples for each.
- viii. Define curie temperature. Also write the value of curie temperature for iron.
- ix. Differentiate between elasticity and plasticity of a material. x. Why ordinary silicon diodes do not emit light?
- xi. Evaluate the gain of a non-inverting amplifier for external resistances  $R_1 = 5K\Omega$  and  $R_2 = 20K\Omega$ .
- xii. Draw characteristic curves for the forward biased and reverse biased  $p - n$  junction diode.

4. Write short answers of any six parts from the following:

(6x2=12)

- i. Show that  $\epsilon$  and  $\frac{\Delta\phi}{\Delta t}$  have the same units. ii. Write any four applications of photocell.
- iii. Can a D.C. motor be turned into a D.C. generator? What changes are required to be done?
- iv. What is the main difference between A.C. generator and D.C. generator in its construction?
- v. What are the measurements on which two observers in relative motion will always agree upon?
- vi. Will bright light eject more electrons from a metal surface than dimmer light of the same colour?
- vii. Is it possible to create a single photon in annihilation of matter? Explain briefly.
- viii. Can the electron in the ground state of hydrogen absorb a photon of energy 13.6 eV and greater than 13.6 eV?
- ix. Differentiate between excited state and metastable state. Also write the residing times for each state.

**SECTION-II**

Note Attempt any three questions. Each question carries equal marks:

(8x3=24)

5. (a) Derive the relation for energy stored in a capacitor. Calculate the energy density. (5)
- (b) A platinum wire has a resistance of 10 $\Omega$  at 0 $^{\circ}$ C and 20 $\Omega$  at 273 $^{\circ}$ C. Find the value of temperature coefficient of resistance of platinum. (3)
6. (a) What is alternating current generator? Find the value of instantaneous induced current by it. (5)
- (b) A power line 10 m high carries a current 200A. Find the magnetic field of the wire at the ground? (3)
7. (a) Derive an expression for resonance frequency in R-L-C series circuit. Also write down the properties of the series resonance. (5)
- (b) The current flowing into the base of a transistor is 100 $\mu$ A. find its collector current  $I_c$ , its emitter current  $I_E$  and the ratio  $I_c/I_E$ , if the value of current gain  $\beta$  is 100. (3)
8. (a) Explain "Energy Band Theory" of solids. How does it help to distinguish between conductors, insulators & semi conductors? (5)
- (b) What is the maximum wavelength of two photons produced when a positron annihilates an electron? The rest mass energy of each is 0.51 MeV. (3)
9. (a) What are inner shell transition? Also discuss the production of x-rays. (5)
- (b) If  ${}_{92}^{233}\text{U}$  decays twice by  $\alpha$ -emission, what is the resulting isotopes? (3)

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## Physics (Objective)

(GROUP-II)

Time: 20 Minutes

Marks : 1

RWP-2-24

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

- 1.1 The rest mass of photon is:  
(A) Zero (B)  $1.67 \times 10^{-27} \text{ kg}$  (C)  $1.67 \times 10^{-31} \text{ kg}$  (D)  $9.1 \times 10^{-31} \text{ kg}$
2. X-rays are also known as:  
(A) Cathode rays (B) Positive rays (C) r-rays (D) Alpha rays
3. The atomic number of  $^{141}_{56}\text{Ba}$  is:  
(A) 141 (B) 56 (C) 85 (D) 92
4. One unified mass scale (1U) is equal to:  
(A)  $1.66 \times 10^{-19} \text{ kg}$  (B)  $1.66 \times 10^{-27} \text{ kg}$  (C)  $1.66 \times 10^{-31} \text{ kg}$  (D)  $1.66 \times 10^{-28} \text{ kg}$
5. Value of dielectric constant for vacuum is:  
(A) Less than 1 (B) Greater than 1 (C) One (D) 1.5
6. Gold band on resistor represent its tolerance equal to:  
(A)  $\pm 10\%$  (B)  $\pm 5\%$  (C)  $\pm 15\%$  (D)  $\pm 20\%$
7. An apparatus placed within a metal enclosure is "shielded" from:  
(A) Electric field (B) Magnetic field (C) Gravitational field (D) Electromagnetic field
8. The SI unit of magnetic induction is:  
(A) Weber (B) Tesla (C) Newton (D) Joule
9. The sensitivity of Galvanometer can be increased by decreasing:  
(A)  $C/BAN$  (B)  $B/ACN$  (C)  $CB/AN$  (D)  $NC/AB$
10. The minus sign in Faraday's law of electromagnetic induction shows that the direction of induced  $emf$  is such that it opposes the change in:  
(A) Electric flux (B) Electromagnetic flux (C) Gravitational flux (D) Magnetic flux
11. The  $emf$  induced in a generator is:  
(A)  $N\omega AB \sin\theta$  (B)  $N\omega IB \sin\theta$  (C)  $NAB \sin\theta$  (D)  $N\omega B \sin\theta$
12. If  $I_0$  is the peak value of A.C current, its average value over a complete cycle is:  
(A)  $\sqrt{2} I_0$  (B)  $I_0 / \sqrt{2}$  (C)  $\sqrt{\frac{I_0}{2}}$  (D) Zero
13. The value of angular frequency " $\omega$ " is equivalent to:  
(A)  $2\pi T$  (B)  $4\pi f$  (C)  $2\pi f$  (D)  $\pi f$
14. Based on the geometrical structure and arrangement of atoms, there are \_\_\_\_ crystal systems:  
(A) 6 (B) 5 (C) 7 (D) 8
15. The potential barrier for the  $Ge^n$  at room temperature is:  
(A) 0.7 v (B) 1.0 v (C) 0.6 v (D) 0.3 v
16. The mathematical notation for exclusive OR-operation is:  
(A)  $X = \overline{A + B}$  (B)  $X = A \overline{B} + B \overline{A}$  (C)  $X = \overline{AB + BA}$  (D)  $X = \overline{A - B}$
17. The photoelectric effect explained by:  
(A) Darission (B) Gerwer (C) Hertz (D) Einstein

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## SECTION-I

2. Write short answers of any eight parts from the following:

RWP-2-24

(8x2=16)

- Differentiate between electric potential difference and electric potential energy difference and write its relation.
- Why is the potential difference between the plates of capacitor decreased when dielectric material is inserted between the plates?
- Describe the force or forces on a positive point charge when placed between parallel plates with opposite & equal charges.
- If a point charge  $q$  of mass  $m$  is released in a non-uniform electric field with field lines pointing in the same direction, will it make a rectilinear motion?
- What is the advantage of synchronization control in case of CRO?
- What is digital multimeter? Why is it easier to use?
- How can a current loop be used to determine the presence of a magnetic field in a given region of space?
- What should be the orientation of a current carrying coil in a magnetic field so that torque acting upon the coil is (a) maximum (b) minimum?
- Equal doses of different radiations do not produce same biological effect. Explain.
- Name the six quarks.
- State two sources of "background radiation"
- How can radioactivity help in the treatment of cancer?

3. Write short answers of any eight parts from the following:

(8x2=16)

- What are the difficulties in testing whether the filament of a lighted bulb obeys Ohm's law?
- What is thermistor? Write its principle.
- Explain under what condition, the wheat stone bridge is said to be balanced?
- How many times per second will an incandescent lamp reach maximum brilliance when connected to a 50Hz source?
- What is modulation signal and what are the carrier wave?
- Why the choke is used in A.C. circuits?
- What is meant by strain energy? How can it be determined from the force-extension graph?
- Differentiate between Young's modulus and Bulk's modulus.
- What is hysteresis loss?
- What is a net charge on a n-type or a p-type substance?
- How is p-n junction formed?
- Calculate the gain of a non-inverting amplifier when  $R_1 = \text{infinity}$  and  $R_2 = 0$

4. Write short answers of any six parts from the following:

(6x2=12)

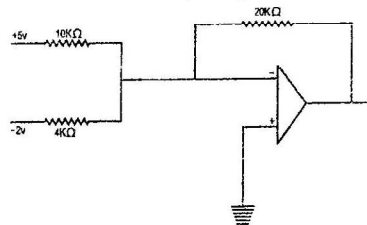
- Does the induced  $emf$  in a circuit depend on the resistance of the circuit?
- Is it possible to change both the area of the loop and magnetic field passing through the loop and still not have an induced  $emf$  in the loop?
- When does light behave as a wave? When does it act as a particle?
- If an electron and proton have the same de-broglie wavelength, which particle has greater speed?
- How can the spectrum of hydrogen contain so many lines? when hydrogen contain one electron.
- What is the principle of A.C. generator?
- What are inertial and non-inertial frame of references?
- What is the difference between special theory of relativity and general theory of relativity?
- Differentiate between ionization energy and excitation energy.

## SECTION-II

Note Attempt any three questions. Each question carries equal marks:

(8x3=24)

- (a) Derive a relation for electrical potential at a point due to a point charge. (5)  
(b) The resistance of an iron wire at  $0^\circ\text{C}$  is  $1 \times 10^4 \Omega$ . What is resistance at  $500^\circ\text{C}$ , if the temperature co-efficient of resistance of iron is  $5.2 \times 10^{-3} \text{K}^{-1}$ ? (3)
- (a) Define transformer. Explain its principle, construction and working. (5)  
(b) What current should pass through a solenoid that is 0.5 m long with 10,000 turns of copper wire so that it will have a magnetic field of 0.4T? (3)
- (a) What is the series resonance circuit? Derive the relation of resonance frequency and write down its properties. (5)  
(b) Calculate the output of the op-amp circuit shown in figure: (3)



- (a) Write a note on energy band theory and classify conductors, insulators and semiconductors on the basis of this theory. (5)  
(b) What is the maximum wavelength of the two photons produced when a positron annihilates an electron? The rest mass energy of each is 0.51 MeV. (3)
- (a) Define fusion reaction. Explain it in sun with the help of nuclear reactions. (5)  
(b) Compute the shortest wavelength radiation in Balmer series? What value of ' $n$ ' must be used. (3)

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