

PHYSICS HSSC-II

SECTION – A (Marks 17)

Time allowed: 25 Minutes

NOTE:- Section-A is compulsory and comprises pages 1-2. All parts of this section are to be answered on the question paper itself. It should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Insert the correct option i.e. A / B / C / D in the empty box provided opposite each part. Each part carries one mark.

(i) The copying process is called:

- A. Xerography
B. Topography
C. Neurography
D. Spectroscopy

(ii) When air is used as dielectric between the plates of a parallel plate capacitor then its capacitance is:

- A. $\frac{A\epsilon_0}{d}$
B. $\frac{Q}{A\epsilon_0}$
C. $\frac{Qd}{A\epsilon_0}$
D. $\frac{Q}{A\epsilon_0 d}$

(iii) The terminal potential difference of a cell is given by:

- A. $V_t = \frac{E}{R+r}$
B. $V_t = E - IR$
C. $V_t = \frac{E}{IR}$
D. None of these

(iv) In SI unit the value of μ_0 is:

- A. $4\pi \times 10^7 \text{ WbA}^{-1}\text{m}^{-1}$
B. $4\pi \times 10^{-7} \text{ WbA}^{-1}\text{m}$
C. $4\pi \times 10^7 \text{ WbAm}^{-1}$
D. $4\pi \times 10^{-7} \text{ WbA}^{-1}\text{m}^{-1}$

(v) The e/m of an electron moving with the speed along a circular path in a magnetic field is given as:

- A. $\frac{e}{m} = \frac{B^2 R}{E}$
B. $\frac{e}{m} = \frac{E}{B^2 R}$
C. $\frac{e}{m} = \frac{E^2}{B^2 R}$
D. $\frac{e}{m} = \frac{ER}{B^2}$

(vi) The principle of electric generator depends upon:

- A. Lenz's law
B. Faraday's law
C. Coulomb's law
D. Ohm's law

- (vii) The current passing through a choke coil of $5H$ is decreased at the rate of $2 A/s$, the induced *e.m.f.* in the coil is:
- A. $2.5V$ B. $-2.5V$
C. $10V$ D. $-10V$
- (viii) When $X_L = X_C$, this condition is called:
- A. Balanced B. Equality
C. Resonance D. All of these
- (ix) The process of combining low frequency signal with a high frequency radio wave is called:
- A. Demodulation B. Modulation
C. Resonance D. Impedance
- (x) The substances in which magnetic fields produced by orbital and spin molecules of the electron add up to zero are called:
- A. Ferromagnetic B. Diamagnetic
C. Paramagnetic D. None of these
- (xi) A trivalent impurity is usually called:
- A. Acceptor B. Donor
C. Rectifier D. Transistor
- (xii) Which of the following is NOT basic operation of Boolean variables?
- A. YES operation B. NOT operation
C. AND operation D. OR operation
- (xiii) A forward biased p-n junction practically offers:
- A. Zero resistance B. Very low resistance
C. Very high resistance D. None of these
- (xiv) The existence of positron was discovered in the:
- A. Thermal radiation
B. Cosmic radiation
C. Electromagnetic radiation
D. Non-electromagnetic radiation
- (xv) When x-rays are passed through successive aluminum sheets, their hardness:
- A. Decreases B. Increases
C. Remains same D. None of these
- (xvi) The energy equivalent to one atomic mass unit is:
- A. $1.6 \times 10^{-19} J$ B. $6.02 \times 10^{23} J$
C. $931 MeV$ D. $9.31 MeV$
- (xvii) The solar energy is mainly due to:
- A. Fission B. Fusion
C. Pair production D. All of these

SECTION – B (Marks 42)

Q. 2 Attempt any FOURTEEN parts. The answer to each part should not exceed 3 to 4 lines. (14 x 3 = 42)

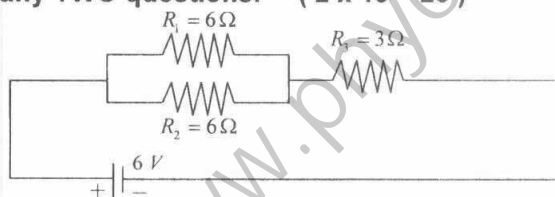
- (i) The potential is constant throughout a given region of space. Is the electrical field zero or no-zero in this region? Explain.
- (ii) Is it true that Gauss's law states that the total number of lines of forces crossing any closed surface in the outward direction is proportional to the net positive charge enclosed within surface?
- (iii) A potential difference is applied across the ends of a copper wire. What is the effect on the drift velocity of free electron by:
 - a. Increasing the potential difference.
 - b. Decreasing the length and the temperature of the wire.
- (iv) Is the filament resistance lower or higher in $500W, 220V$ light bulb than in a $100W, 220V$ bulb?
- (v) A plane conducting loop is located in a uniform magnetic field that is directed along the x-axis. For what orientation of the loop is the flux a maximum? For what orientation is the flux a minimum?
- (vi) If a charged particle moves in a straight line through some region of space, can you say that the magnetic field in the region is zero.
- (vii) Show that ε and $\frac{\Delta\phi}{\Delta t}$ have the same units.
- (viii) When the primary coil of a transformer is connected to A.C mains the current in it:
 - a. Is very small if the secondary circuit is open, but
 - b. Increases when the secondary circuit is closed. Explain these facts.
- (ix) Name the device that will (a) permit flow of direct current but oppose the flow of alternating current (b) permit flow of alternating current but not the direct current.
- (x) What is meant by A.M and F.M?
- (xi) What is meant by hysteresis loss? How is it used in the construction of a transformer?
- (xii) What is the effect of forward and reverse biasing of a diode on the width of depletion region?

- (xiii) Which photon, red, green or blue carries the most energy and momentum?
- (xiv) If measurements show a precise position for an electron, can those measurements show precise momentum also? Explain.
- (xv) What are the advantages of laser over ordinary light?
- (xvi) The radioactive element ${}^{226}_{88}\text{Ra}$ has a half-life of 1.6×10^3 years. Since the earth is about 5 billion years old, how can you explain that we still can find this element in nature.
- (xvii) Why a photo diode is operated in reverse biased state?
- (xviii) Name different groups of sub-atomic particles. Also differentiate between hadrons and leptons.
- (xix) Complete the following equations:
- a. ${}^{226}_{88}\text{Ra} \rightarrow {}^{222}_{86}\text{Rn} + \dots\dots\dots$ b. $\dots\dots\dots \rightarrow {}^1_1\text{H} + {}^0_{-1}\text{e}$
- c. $\pi T_{1/2} = \dots\dots\dots$

SECTION – C (Marks 26)

Note:- Attempt any TWO questions. (2 x 13 = 26)

Q. 3



- a. State and explain ohms law. Calculate the equivalent resistance when a number of resistances are connected in (i) series and (ii) in parallel. 1+2+2+2
- b. Differentiate between resistivity and conductivity. 02
- c. Find the equivalent resistance of the circuit, total current drawn from source and the current through each resistance. 04
- Q. 4**
- a. Define Transistors. How can we use transistor as an amplifier? 2+5
- b. What is voltage gain of an amplifier? 02
- c. The current flowing into the base of a transistor is $100\mu\text{A}$. Find its collector current I_C , emitter current I_E and the ratio I_C / I_E , if the value of current gain β is 100. 04
- Q. 5**
- a. Define Photoelectric effect. Explain the same on the bases of quantum theory and derive Einstein photoelectric equation. 2+5
- b. How can the spectrum of hydrogen contain so many lines when hydrogen contains only one electron? 02
- c. Sodium surface is illuminated with light of wave length 300nm . The work function for sodium metal is 2.46eV . 04
- (i) Find the maximum K.E of ejected electron.
- (ii) Determine the cutoff wavelength for sodium.