

Roll No. 

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Answer Sheet No. \_\_\_\_\_

Sig. of Candidate. \_\_\_\_\_

Sig. of Invigilator. \_\_\_\_\_

13

## PHYSICS HSSC-II

### SECTION - A (Marks 17)

Time allowed: 25 Minutes

**NOTE:** Section-A is compulsory. 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.

1. Circle the correct option i.e. A / B / C / D. Each part carries one mark.

- (i) The Value of  $\epsilon_0$  permittivity for free space is:  
 A.  $9 \times 10^9 N-m^2 C^{-2}$  B.  $8.85 \times 10^{-12} \frac{C^2}{Nm^2}$  C.  $1.6 \times 10^{-19} C$  D.  $9.1 \times 10^{-19} \frac{Cm^2}{N}$
- (ii) A  $50 \mu F$  capacitor has a potential difference of  $8V$  across it. The charge on the capacitor is:  
 A.  $4 \times 10^{-4} C$  B.  $4 \times 10^{-2} C$  C.  $4 \times 10^{-6} C$  D.  $4 \times 10^{-12} C$
- (iii) If time constant in R-C circuit is small, the capacitor is charged:  
 A. Rapidly B. Slowly  
 C. Neither rapidly nor slowly D. Infinitely
- (iv) Which of the following relations between current  $I$  and the angle of deflection is true for a moving coil galvanometer?  
 A.  $I \propto \theta$  B.  $I \propto \frac{1}{\theta}$  C.  $I \propto \sin \theta$  D.  $I \propto \cos \theta$
- (v) Reactance of a capacitor connected across an A.C Source is given by:  
 A.  $X_c = \omega C$  B.  $X_c = \frac{\omega}{C}$  C.  $X_c = \frac{1}{\omega C}$  D.  $X_c = \frac{1}{\omega^2 C^2}$
- (vi) For RL series A.C circuit, the voltage leads the current by a phase angle of:  
 A.  $\theta = \tan^{-1}(\omega LR)$  B.  $\theta = \tan^{-1}(\frac{\omega L}{R})$  C.  $\theta = \tan^{-1}(\frac{R}{\omega L})$  D.  $\theta = \tan^{-1}(\frac{1}{\omega LR})$
- (vii) The critical temperature for lead is:  
 A.  $1.18 k$  B.  $3.72 k$  C.  $7.2 k$  D.  $125 k$
- (viii) The current gain of a transistor given by the relation is:  
 A.  $\beta = \frac{I_c}{I_B}$  B.  $\beta = \frac{I_E}{I_C}$  C.  $\beta = \frac{I_B}{I_E}$  D.  $\beta = \frac{I_E}{I_B}$
- (ix) The open loop gain of the operational amplifier is of order:  
 A.  $10^{-4}$  B.  $10^5$  C.  $10^{-5}$  D.  $10^{-6}$
- (x) The value of Stefan's constant  $\delta$  is given by:  
 A.  $5.67 \times 10^{-8} Wm^{-2}k^{-4}$  B.  $5.67 \times 10^8 Wm^{-2}k^{-4}$   
 C.  $5.67 \times 10^{-18} Wm^{-2}k^{-4}$  D.  $5.67 \times 10^{18} Wm^{-2}k^{-4}$
- (xi) In Compton effect, the value of the factor  $\frac{h}{m_0 c}$  is about:  
 A.  $2.43 \times 10^{-12} m$  B.  $2.43 \times 10^{-4} m$  C.  $2.43 \times 10^{12} m$  D.  $2.43 \times 10^{-6} m$
- (xii) The value of Rydberg constant is:  
 A.  $1.0974 \times 10^7 m^{-1}$  B.  $1.0974 \times 10^{-7} m^{-1}$   
 C.  $1.0974 \times 10^9 m^{-1}$  D.  $1.0974 \times 10^{-9} m^{-1}$
- (xiii) The binding energy of helium is:  
 A.  $22.24 Mev$  B.  $28.2 Mev$  C.  $2.2 Mev$  D.  $222 Mev$
- (xiv) The half life of radium-226 is:  
 A.  $4.5 \times 10^9$  yrs B.  $1620$  yrs C.  $3.8$  days D.  $23.5$  min
- (xv) An  $\alpha$ -particle has a charge of:  
 A.  $+2e$  B.  $-2e$  C.  $+e$  D.  $-e$
- (xvi) Thyroid cancer is cured by:  
 A. Cobalt - 60 B. Carbon - 14  
 C. Iodine - 131 D. Nickel - 63
- (xvii) Which of the following particles is NOT Leptons?  
 A. Electrons B. Muons C. Neutrinos D. Mesons

For Examiner's use only:

Total Marks:

17

Marks Obtained:



# PHYSICS HSSC-II

14

Time allowed: 2:35 Hours

Total Marks Sections B and C: 60

NOTE: Sections B and C comprise pages 1-2. Answer any fourteen parts from Section 'B' and any two questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly.

## SECTION - B (Marks 42)

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

- (i) Explain briefly the applications of charging and discharging of capacitor.
- (ii) What are the advantages of measuring potential differences with potentiometer?
- (iii) Write down rules for finding the value of a Carbon resistances.
- (iv) When a current carrying conductor is placed in magnetic field, it experiences a force. On what factors this force depends?
- (v) A magnetic field accelerates a charged particle, but does no work on the particle. Explain this statement.
- (vi) A velocity selector has a magnetic field of 0.30 T. If a perpendicular electric field of  $1000 \text{ V/m}$  is applied. What will be the speed of the particle that will pass through the selector?
- (vii) What is back emf effect in motors?
- (viii) What is the impedance of the R-L series circuit? What is the phase angle between V and I?
- (ix) How is a three phase A.C voltage generated?
- (x) What is meant by reactance of a capacitor? How does it vary with frequency?
- (xi) What are superconductors? Explain briefly.
- (xii) Write down the conventional current equation and current gain of transistor.
- (xiii) What is meant by open loop gain of operational amplifier?
- (xiv) Will higher frequency light eject greater number of electrons than lower frequency light?
- (xv) Why do we say that electrons have wave properties? Why do we say that electrons have particle properties.
- (xvi) Describe different uses of laser in medicine.
- (xvii) Show that  $1 \text{ amu} = 931 \text{ Mev}$
- (xviii) What is meant by mass defect or mass deficit? Write down its expression.
- (xix) What is the composition of protons and neutrons in terms of quarks?

## SECTION - C (Marks 26)

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

- Q. 3
- a. What is an "Avometer"? Describe its various functions with the help of various circuit diagrams. (06)
  - b. What is Digital Multimeter? Explain briefly. (03)
  - c. What shunt resistance must be connected across a galvanometer of  $50 \Omega$  resistance which gives full scale deflection with 2mA current, so as to convert it into an ammeter of range 10 Amp? (04)
- Q. 4
- a. Describe the working of an op-amplifier as non-inverting amplifier. Also find an expression for gain. (06)
  - b. Describe an Op-amplifier as a comparator. (04)
  - c. Calculate the gain of an amplifier in which the collector resistance  $R_c$  is  $5k\Omega$ . The input resistance between the base and emitter of a typical transistor is  $2.5k\Omega$  and the value of its  $\beta = 100$ . (03)
- Q. 5
- a. Derive an expression for hydrogen spectrum, using the 3rd postulate of Bohr's theory and deduce Bohr's 2nd postulate with de-Broglie wavelength hypothesis. (06)
  - b. The Orbital electron of a hydrogen atom moves with a speed of  $5.456 \times 10^5 \text{ m/s}$ .
    - (i) Find the value of the quantum number 'n' associated with this electron. (02)
    - (ii) Calculate the energy of electron in this orbit. (02)
  - c. How can the spectrum of hydrogen contain so many lines when hydrogen contains one electron? (03)