AT–376

B.Sc. Part—III (Semester—V) Examination

PHYSICS

Time : Three Hours]   [Maximum Marks : 80

N.B. :— (1) **All** questions are compulsory.

(2) Draw neat diagram wherever necessary.

Constants :

Velocity of light (c)   = 3×10^8 m/s

Planck's constant (h)   = 6.63×10^{-34} J.s

Mass of an electron (m)   = 9.11×10^{-31} kg

1. (A) Fill in the blanks :

(i) The energy of a photon having frequency v is _____.

(ii) Stoke's lines are more intense than _____ in Raman effect.

(iii) Hydrogen bomb is based on _____.

(iv) Hybrid parameter, hie stands for _____.   2

(B) Choose correct alternative :

(i) In Phase Shift Oscillator each RC network produces a phase shift of :

(a) 90°   (b) 180°

(c) 360°   (d) 60°

(ii) The de Broglie relation is given by :

(a) $\lambda = c/v$ (b) $\lambda = v/c$

(c) $\lambda = \dfrac{h}{P}$ (d) $\lambda = \dfrac{P}{h}$

(iii) Principal quantum number (n) determines the size of :

(a) Electron orbit   (b) Proton

(c) Electron   (d) Nucleus

(iv) hfe stands for :

(a) Reverse current ratio   (b) Forward voltage ratio

(c) Forward current ratio   (d) Reverse voltage ratio   2

(C) Answer in **one** sentence each :

    (i)   What are two main types of spectra ?

    (ii)   Why G.M. Counter cannot detect unchanged particle ?

    (iii) What is stopping potential ?

    (iv) What is β-decay ?   4

EITHER

2. (A) State Heisenberg's uncertainty principle.   2

    (B) If uncertainty in the position of an electron is 1×10^{-16}m. Calculate uncertainty in its momentum.   4

    (C) What is Photoelectric effect ? Explain its characteristics.   6

OR

3. (P) State Wein's Displacement Law.   2

    (Q) What is Compton effect ? Explain it on the basis of quantum theory.   4

    (R) Describe thought experiment with single slit diffraction of electrons in support to uncertainty principle.   6

EITHER

4. (A) What is wave function ψ ? Explain its physical significance.   4

    (B) Explain the term zero point energy.   2

    (C) Obtain Schrodinger's time independent equation.   6

OR

5. (P) Explain the terms :

      (i)   Eigen Functions

      (ii)   Eigen Values.   4

    (Q) State the limitations of wave function.   2

    (R) Solve the Schrondinger's wave equation for a free particle in one-dimensional box. Hence obtain its eigen values.   6

EITHER

6. (A) Explain emission spectra and absorption spectra.   4

    (B) State the selection rules for L and J.   2

    (C) Describe the Stern-Gerlach experiment and discuss its result.   6

OR

7. (P) State and explain Moseley's Law. Give its importance.   4

    (Q) What are the stoke's lines and antistoke's lines ?   2

    (R) Explain the origin of characteristic X-Rays spectra by using energy level diagram.   6

EITHER

8. (A) Explain the terms :

         (i)   Mass defect (Δm)

         (ii) Binding energy.   4

    (B) What is Geiger-Nuttal Law ?   2

    (C) Describe the construction and working of G.M. Counter.   6

OR

9. (P) State the properties of α-particles.   2

    (Q) Distinguish between Nuclear fission and Nuclear fusion.   4

    (R) Describe the construction and working of Nuclear Reactor with diagram.   6

EITHER

10. (A) What are the four hybrid parameters ?   2

    (B) What is noise ? Explain the different types of noises.   4

    (C) Draw hybrid equivalent of CE amplifier and derive the expression for input impedance and
         current gain.   6

OR

11. (P) Define stability factor. 2

    (Q) Explain the classification of amplifiers on the basis of operating point. 4

    (R) Draw equivalent circuit of two stage RC coupled amplifier. Obtain an expression for its gain in mid frequency range. 6

EITHER

12. (A) State the advantages of Negative Feedback. 2

    (B) Distinguish between Amplifier and Oscillator. 4

    (C) Explain construction and working of Hartley Oscillator. 6

OR

13. (P) State the applications of bistable multivibrator. 2

    (Q) Explain the construction and working of Astable Multivibrator. 6

    (R) Obtain an expression for voltage gain with feedback. 4