AU–131

B.Sc. Part—III Semester—V Examination
PHYSICS

Time : Three Hours]   [Maximum Marks : 80

Note :—(1)   All questions are compulsory.

(2)   Draw neat diagram wherever necessary.

Constants :

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

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

Velocity of light (c) = 3×10^8 m/s

1.   (A)   Fill in the blanks :—   2

(i)   Stopping potential is directly proportional to _____ of incident radiation.

(ii)   Stern Gerlach experiment proves the concept of _____ .

(iii)   G.M. counter should be operated in _____ region.

(iv)   Multivibrator has _____ feedback.

(B)   Choose correct alternative :—   2

(i)   Astable Multivibrator uses _____ energy strong element.

(a)   one   (b)   two

(c)   three   (d)   four

(ii)   The constant $\hbar$ is equal to :

(a) $\dfrac{h}{2\pi}$ (b) $\dfrac{2\pi}{h}$

(c) $2\pi h$ (d) $\dfrac{h}{2}$

(iii)   The noise generated in resistors, vaccum tubes, transistors and in any conductor is known as _____ noise.

(a)   Internal   (b)   External

(c)   Short   (d)   Partition

VOX   35307   1   (Contd.)

(iv) Small letters like s, p, d, f and i, s, j are used to describe the state of _____ .

    (a) atom   (b) molecule

    (c) electron   (d) ions

(C) Answer in **ONE** sentence :—   4

    (i) What is Raman shift ?

    (ii) What is Photon ?

    (iii) What is positive feedback ?

    (iv) What is beta decay ?

EITHER

2. (A) Give assumptions of Planck's Quantum theory.   3

   (B) What is threshold frequency and stopping potential in photoelectric effect ?   3

   (C) Define Group velocity and Phase velocity and derive relation between them.   6

OR

3. (P) Explain dual Nature of Matter.   3

   (Q) State and explain Heisenberg's uncertainty principle.   3

   (R) Describe Davisson and Germer Experiment to prove wave nature of electron.   6

EITHER

4. (A) What do you mean by tunneling through the barrier ?   3

   (B) What are the conditions and limitations that the wave function must satisfy ?   3

   (C) Obtain three dimensional time independent Schrodinger wave equation from time dependent Schrodinger's equation.   6

OR

5. (P) Obtain Schrodinger wave equation for simple Harmonic Oscillator.   3

   (Q) Obtain the quantum mechanical operator for momentum.   3

   (R) Obtain an expression for the wave function for a particle in three dimensional box and show that energies of particle are given by :

$$E = \frac{\pi^2 h^2}{2m}\left[\frac{n_x^2}{a^2} + \frac{n_y^2}{b^2} + \frac{n_z^2}{c^2}\right]$$
                                                              6

EITHER

6. (A) What are selection rules ? Explain L-S coupling. 3

   (B) Explain quantum theory of Raman effect. 4

   (C) Describe the experimental arrangement for the study of Raman effect. 5

OR

7. (P) State and explain Duane Hunts's Law. 4

   (Q) What is L-S coupling ? 2

   (R) What are quantum numbers ? Explain the significance of four quantum numbers. 6

EITHER

8. (A) State the properties of neutrino. 2

   (B) Explain :—

       (i) Quenching

       (ii) Plateau-region. 4

   (C) What is the range of alpha particles ? Describe experimental method for its determination. 6

OR

9. (P) State the uses of Nuclear Reactor. 2

   (Q) Explain the different types of β-decay. 6

   (R) Explain :—

       (i) Binding energy

       (ii) Nuclear stability. 4

EITHER

10. (A) What is class A amplifier ? 2

    (B) State and explain different types of distortions in amplifier. 6

    (C) Obtain two basic equations of hybrid parameters for transistor in CE mode. 4

OR

11. (P) What is an operating point ? 2

    (Q) Obtain an expression for the gain of Cascade amplifier. 4

    (R) Draw hybrid equivalent circuit of two stage RC coupled amplifier for mid frequency region and discuss its gain frequency response. 6

EITHER

12. (A) Explain the voltage series and current series negative feedback.   4

    (B) Discuss the construction and working of phase shift oscillator with diagram.   6

    (C) State advantages of Wein Bridge Oscillator.   2

OR

13. (P) Discuss the operation of bistable multivibrator with diagram.   5

    (Q) What is Barkhausen Criterion for oscillation ?   2

    (R) Explain the action of monostable multivibrator with neat diagram.   5