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

Time : Three Hours]   [Maximum Marks : 80

Note :— (1) All questions are compulsory.

(2) Draw neat labeled diagrams wherever necessary.

Constants : $m_e = 9.11 \times 10^{-31}$ kg, h = 6.63×10^{-34} Js, $m_n = 1.67 \times 10^{-27}$ kg

1. (A) Fill in the blanks :—   2

   (i) The localized structure formed by the superposition of large number of matter waves of different frequencies is called ....

   (ii) The diode which works on the principle of barrier penetration is called ....

   (iii) In Raman spectra, much more intense lines are ....

   (iv) The potential applied to stop the photoelectrons is called as ....

(B) Choose correct alternative :   2

   (i) Compton effect is associated with :

     (a) α–rays   (b) β–rays

     (c) X-rays   (d) Positive rays

   (ii) The rate of change of collector current with respect to collector leakage current is called _____ .

     (a) Current gain   (b) Stablization

     (c) Stability factor   (d) All of these

   (iii) The radiation counters or detectors are not operated in

     (a) GM region   (b) Proportional region

     (c) Recombination region   (d) None of these

   (iv) When one alpha particle is emitted from the nucleus, the atomic number and mass number of daughter nucleus is changed respectively by :

     (a) Four and Two   (b) Two and Two

     (c) Two and Four   (d) Four and Four

(C) Answer in one sentence :   4

   (i) What is phase distortion ?

   (ii) What is mass defect ?

   (iii) What is nuclear fusion ?

   (iv) State the condition for normalized wave function.

EITHER

2. (a) Give assumptions of Planck's Quantum Theory, for black body radiation. 4

   (b) Discuss the effect of intensity of incident radiation on stopping potential in Photoelectric effect. 3

   (c) What is group velocity and phase velocity ? Obtain the relation between them. 5

OR

3. (p) Explain Wein's displacement law of black body radiation. 3

   (q) Describe Davisson and Germer experiment to confirm wave nature of electrons. 6

   (r) Discuss the spectral distribution of black body radiation. 3

EITHER

4. (a) Write an equation for a wave function associated with free particle. Give its physical significance. 4

   (b) Solve Schrodinger equation for a particle in one dimensional rigid box. 6

   Find the Eigen value and Eigen function :

   (c) Find the energy of the electron in ground state moving in one dimensional box of width 2 A.U. 2

OR

5. (p) Obtain a quantum mechanical operator for kinetic energy. 4

   (q) Derive one dimensional time independent Schrodinger wave equation. 6

   (r) Find the lowest energy of a neutron confined to a nucleus of size 10^{-14} m. 2

EITHER

6. (a) Explain the concept of space quantization and spin quantization. 4

   (b) Describe Stern Gerlach experiment and discuss its results. 6

   (c) What is L-S coupling ? 2

OR

7. (p) State and explain Moseley's law. Give its importance. 4

   (q) Describe experiential set up used to study Raman Effect. 4

   (r) Explain characteristics X-ray spectra and its origin. 4

EITHER

8. (a) Describe the construction and working of nuclear reactor. Write the function of cadmium rods used in it. 5

   (b) Explain Pauli's neutrino theory of beta decay. 4

   (c) Draw labeled diagram of G.M. counter with proper graph showing GM region. 3

OR

9. (p) Define :

(i) Binding energy of nucleus	(ii) Nuclear fusion
(iii) Dead time in GM counter	(iv) Recovery time in GM counter

   4

   (q) What is nuclear fission ? 2

   (r) State Geiger-Nuttal law. 2

   (s) What is beta decay ? Explain its modes. 4

EITHER

10. (a) Obtain any two basic equations of hybrid parameters. 5

    (b) Draw hybrid equivalent circuit for CE amplifier. Obtain and expression for input impedance and current gain of it. 5

    (c) What is operating point ? 2

OR

11. (p) State and explain different types of distortion in amplifier. 6

    (q) Explain Class A, B and C amplifier. 6

EITHER

12. (a) With proper circuit diagram, explain detailed construction and working of phase shift oscillator. 6

    (b) Give the construction and working of monostable multivibrator. 4

    (c) Explain feedback in amplifier. 2

OR

13. (p) What is Barkhausen criterion ? 2

    (q) Draw circuit diagram of Hartley oscillator and explain its working. 6

    (r) Explain the working of Astable multivibrator. 4