

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, $h = 6.63 \times 10^{-34}$ 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) Stabilization
 - (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 experimental 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 : 4
- (i) Binding energy of nucleus (ii) Nuclear fusion
- (iii) Dead time in GM counter (iv) Recovery time in GM counter
- (q) What is nuclear fission ? 2
- (r) State Geiger-Nuttall 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 an 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

