

UNIVERSITY OF PUNE

[4361]-9

F. E. (Common)

Applied Science-II

Physics

(2008 Pattern)

Total No. of Questions : 6
[Time : 2 Hours]

[Total No. of Printed Pages :2]
[Max. Marks : 50]

Instructions :

- (1) *Neat diagram must be drawn wherever necessary.*
- (2) *Black figures to the right indicate full marks.*
- (3) *Your advised to attempt not more than 03 questions.*
- (4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- (5) *Assume suitable data, if necessary.*

Constants :

Velocity of light (c) = 3×10^8 m/sec.

Mass of electron (m) = 9.1×10^{-31} kg

Charge on electron (e) = 1.6×10^{-19} C

Planck's constant (h) = 6.625×10^{-34} J-S

Q1.

- a) Explain how the wave group is formed, and obtain an expression for a group velocity. [7]
- b) Explain in short, why ψ is not directly related with probability and obtain Schrodinger's time dependent wave equation [6]
- c) Obtain Heisenberg's uncertainty principle in terms of energy and time [4]

OR

Q2.

- a) Derive an expression for the energy levels and wave functions of a particle enclosed within infinite deep potential well. Draw the probability distribution curves. [7]

- b) State Heisenberg's uncertainty principle and establish it with the help of single slit diffraction experiment [6]
- c) For the particle moving with non-relativistic energy, show that the group velocity is equal to the particle velocity. [4]

Q3.

- a) State the properties of Laser and explain construction and working of solid state laser. [7]
- b) Explain following properties of superconductors.
- 1) Critical magnetic field [3]
 - 2) Critical current density. [3]
- c) State the advantages of optical fiber communication technology over the conventional methods [4]

OR

Q4.

- a) What is holography? State its principle. Explain the process of holography recording and reconstruction [7]
- b) Explain the Meissner effect. Show that superconductors are perfect diamagnet. [6]
- c) Explain with the help of energy level diagram [4]
- 1) Spontaneous emission &
 - 2) Stimulated emission.

Q5.

- a) What is Hall effect? Obtain an expression for Hall voltage and Hall coefficient. State applications of Hall effect. [6]
- b) Explain any two properties nanoparticles. [6]

- c) Calculate the conductivity of pure silicon at room temperature when the concentration of carriers is $1.5 \times 10^{16}/\text{m}^3$ and the mobilities of electrons and holes are 0.12 and 0.05 $\text{m}^2/\text{v}\cdot\text{sec}$ respectively at room temperature. [4]

OR

Q6.

- a) Explain principle, construction and working of solar cell. Explain its characteristic curve [6]
- b) Explain with neat labeled diagram the synthesis of metal nanoparticles by colloidal route. [6]
- c) A silver wire is in the form of a ribbon 0.50cm wide and 0.10 mm thick. When a current of 2Amp passes through the ribbon perpendicular to a 0.80 Tesla magnetic field, how large a hall voltage is produced along the width? The density of silver is $10.5 \text{ gm}/\text{cm}^3$.
(At.wt of silver = 108) [4]