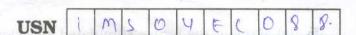
NEW SCHEME



First/Second Semester B.E Degree Examination, July/August 2005

Common to all Branches

Engineering Physics

Time: 3 hrs.]

[Max.Marks: 100

Note: 1. Answer any FIVE full questions.

2. All questions carry eqla marks.

3. Answers must be specific and precise.

4. Draw neat sketches wherever necessary.

Electron mass $m = 9.11 \times 10^{-31} kg$

Electron charge $e = 1.6 \times 10^{-19} C$ Velocity of light $c = 3 \times 10^8 m/s$;

Planck's constant $h = 6.63 \times 10^{-34} J.S$

Permittivity of vacuum, $\epsilon_0 = 8.85 \times 10^{-12} \ F/M$

Avagadro's number, $N_A = 6.025 \times 10^{26} / Kmole$

Boltzmann constant, $K = 1.38 \times 10^{-23} J/K$

- **1.** (a) What are matter waves ? Show that the electron accelerated by a potential difference V volts is $\lambda = 1.226/\sqrt{V}nm$ for non-relativistic case.
 - (b) Explain phase velocity and group velocity. Derive the expression for de Braglie wave length using the concept of group velocity.
 - (c) The speed of electron is measured to within an uncertainty of $2.2 \times 10^4 m/s$ in one dimension. What is the minimum width required by the electron to be confined in an atom. (6+10+4 Marks)
- **2.** (a) What is a wave function? Give its significance. Assuming a particle of mass 'm' is confined in a field free region between impenetrable walls at x=0 and x=a, show that the stationary energy levels of the particle are given by $E_n=n^2h^2/8ma^2$
 - (b) Explain the BCS theory of super conductity.
 - (c) A quantum particle confined to one-dimensional box of width 'a' is known to be in its first excited state. What is the probability of the particle in central half?

 (10+5+5 Marks)
- 3. (a) How does the electrical resistance of the metal change with impurity and temperature?
 - (b) Derive the expression for electrical conductivity in metals interms of relaxation time and explain any three draw backs of classical theory of free electrons.
 - (c) Find the probability with which an energy level 0.2eV below fermilevel being occupied at room temperature of 300K and 1000K. (5+10+5 Marks)
- 4. (a) Explain the properties of Ferrites and mention its two uses.
 - (b) Explain with theory how static dielectric constant of a dielectric material is determined and explain its frequency dependance.

PHY12/22

- (c) The dielectric constant of He gas at NTP is 1.0000684. Calculate the electronic polarisability of He atoms if the gas contains 2.7×10^{25} atoms per m^3 .
- **5.** (a) Explain the terms 'stimulated emission and population inversion. Obtain an expression for energy density of photons in terms of Einstein's co-fficients.
 - (b) Explain the construction and working of Ruby Laser
 - (c) Write a note on measurement of pollutents in atmosphere using laser.
 (10+6+4 Marks)
- 6. (a) Explain the origin of characteristic X-rays.

 - (c) Explain the principle of light propagation in an optical fibre. Derive the expression for numerical aperture in terms of refractive indices of core and cladding.
 - (d) Calculate the number of modes that can be propagated inside an optical fibre, given $n_{core}=1.53,\ n_{clad}=1.50,$ core radians $50\mu m,\ \lambda=1\mu m.$ (5+5+6+4 Marks)
- **7.** (a) Explain the structure of NaCl and calculate the packing fraction for a bcc structure.
- (b) Obtain the expression for inter planar distance interms of Miller indices.
 - (c) Sketch the following planes in a cubic unit cell (101), (121), (010) (10+5+5 Marks)
 - 8. (a) Explain the term MEMS. Discuss different materials used for MEMS.
 - (b) Explain the advatages and disadvantages of composite materials.
- (c) Discuss the different types of nano scale systems. (6+6+8 Marks)

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2. In What is a wave function? Give its significance Assumes a particle of mans

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