Code No: NR-10201. FOR 2001 BATCH ONLY **Set No:1**

**I Year-B.Tech. Regular Examinations, May/June-2004**
**APPLIED PHYSICS**
**(Common to Electrical and Electronics Engineering, Electronics and Communication Engineering, Computer Science and Engineering, Information Technology, Electronics and Instrumentation Engineering, Bio Medical Engineering, Electronics and Control Engineering, Electronics and Telematics, Electronics and Computer Engineering, Computer Science and Systems Engineering)**

**Time: 3 Hours** **Max. Marks: 80**

**Answer any FIVE questions**
**All questions carry equal marks**

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1.a) What is an ionic crystal? Calculate the bond energy for NaCl Molecule.
b) Explain the unit cell. Describe the crystal structure of Cs Cl.

2.a) What are Miller indices? How are they derived?
b) Explain the diffraction of X- rays in case of powder method.
c) Explain vacancy defect in crystal. The fraction of vacancy sites in a metal is $1 \times 10^{-10}$ at $500^0$ C. What will be the fraction of vacancy sites at $1000^0$C.

3.a) Describe Davisson and Germer experiment to confirm the Wave nature of electrons.
b) A partical 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 $E_n = n^2 h^2/8 ma^2$.

4.a) Explain the term's drift velocity, relaxation time and mean free path for free electrons.
b) Explain the quantum theory of free electrons.
c) An electron is confined in one dimensional potential wall of width $3 \times 10^{-10}$m. Find the Kinetic energy of electron when it is in the ground state.

5.a) Compare the dependence of resistance on temperature of a superconductor with that of a normal conductor. Describe briefly Josephson effect.
b) Describe a P – N Junction and explain the effect of forward and reverse biasing on the barrier potential of the Junction.

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6.a) Define the term internal field and derive an expression for the same in the case of solids.

b) Explain the properties of ferri and anti – ferro magnetic materials. Briefly explain their applications.

7.a) Explain spontaneous and simulated emission. Obtain an expression for energy density interims of Einstein's Co-efficient.

b) Define numerical aperture and angle of acceptance in optical fibre. Explain transmission of signal in step index and graded index fibres.

8.a) Show that the Wave length of an accelerated electron by a potential difference of V volts is $\lambda = 1.227/\sqrt{V}$ nm.

b) Derive an expression for electrical conductivity in metals

c) Write a note on solar cells. Physical Constants (given) electron mass M = 9.1 X $10^{-31}$ kg, charge e = 1.6 × $10^{-19}$C planck's constant h = 6.63 × $10^{-34}$ Js, C = 3 × $10^{8}$ m/s, $\varepsilon_0$ = 8.85 × $10^{-12}$ F/m, Boltzman constant K = 1.38 × $10^{-23}$J/K.

Code No: NR-10201. **Set No:2**

**I Year-B.Tech. Regular Examinations, May/June-2004**
**APPLIED PHYSICS**
**(Common to Electrical and Electronics Engineering, Electronics and Communication Engineering, Computer Science and Engineering, Information Technology, Electronics and Instrumentation Engineering, Bio Medical Engineering, Electronics and Control Engineering, Electronics and Telematics, Electronics and Computer Engineering, Computer Science and Systems Engineering)**

**Time: 3 Hours** **Max. Marks: 80**

**Answer any FIVE questions**
**All questions carry equal marks**

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1.a) Explain the bonding in NaCl.
b) Deduce the packing fractions for fcc and bcc lattice.
c) Chromium has bcc structure. Its atomic radius is 0.1249 nm. Calculate free volume/unit cell.

2.a) Explain the method of representing directions in a crystal.
b) Explain edge dislocation and screw dislocation.
c) A beam of X – rays of wave length 0.071nm is diffracted by (110) plane of rock salt with lattice constant of 0.28nm. Find the glancing angle for $2^{nd}$ order diffraction.

3.a) Explain the significance of Wave function.
b) Assuming the time independent Schrodinger's Wave equation, discuss the solution for a partical in one dimensional potential well of infinite hight.
c) An electron is bound in one dimensional infinite well of width $1 \times 10^{-10}$m. Find the energy values in the ground state and first excited state.

4.a) How does the electrical resistance of the metal change with impurity and temperature?
b) Explain Fermi – dirac distribution for electrons in a metal. Discuss its variation with temperature.
c) Find the temperature at which there is 1% probability that a state with an energy 0.5 ev above termi energy will be occupied.

5.a) Explain drift and diffusion currents of a Semiconductor. Explain Einstein relation relating to these currents.

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b) Explain Meissner effect. Discuss Type – I and Type – II super conductors with example.

6.a) Describe different polarization mechanisms. Explain the effect of frequency on dielectric constant.

b) Explain Bohr magneton. Describe properties of ferromagnetic materials.

7.a) Explain the term active medium and population inversion. Explain the working of a semiconductor laser.

b) Explain types of optical fibres. Mention advantages and limitations of optical communication system.

8.a) Describe G.P Thomson's experiment to verify the dual nature of matter.

b) Explain quantum theory of free electrons.

c) De broglie wave length of an electron is 0.166nm. Calculate the kinetic energy of an electron. Physical constants (given) Electron mass, $m = 9.1 \times 10^{-31}$Kg. Charge $e = 1.6 \times 10^{-19}$C Planck's constant $h = 6.63 \times 10^{-34}$ J.s, $C = 3 \times 10^{8}$m/s permittivity of vaccum $E_0 = 8.85 \times 10^{-12}$ F/m Boltzman constant $K = 1.38 \times 10^{-23}$ J/K.

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**Set No: 3**

**I Year-B.Tech. Regular Examinations, May/June-2004**
**APPLIED PHYSICS**
**(Common to Electrical and Electronics Engineering, Electronics and Communication Engineering, Computer Science and Engineering, Information Technology, Electronics and Instrumentation Engineering, Bio Medical Engineering, Electronics and Control Engineering, Electronics and Telematics, Electronics and Computer Engineering, Computer Science and Systems Engineering)**

**Time: 3 Hours** **Max. Marks: 80**

**Answer any FIVE questions**
**All questions carry equal marks**

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1.a) What is an ionic crystal? Calculate the bond energy for Nacl Molecule.
b) Explain the unit cell. Describe the crystal structure of Cs Cl.

2.a) Explain the method of representing directions in a crystal.
b) Explain edge dislocation and screw dislocation.
c) A beam of X – rays of wave length 0.071nm is diffracted by (110) plane of rock salt with lattice constant of 0.28nm. Find the glancing angle for $2^{nd}$ order diffraction.

3.a) What are matter Waves? Explain G.P.Thomson's experiment in support of matter Waves.
b) Assuming the time independent schrodinger's Wave equation, discuss the solution for a partical in one dimensional potential well of infinite hight.

4.a) Explain the term's drift velocity, relaxation time and mean free path for free electrons.
b) Explain the quantum theory of free electrons.
c) An electron is confined in one dimensional potential wall of width $3 \times 10^{-10}$m. Find the Kinetic energy of electron when it is in the ground state.

5.a) Explain drift and diffusion currents of a Semiconductor. Explain Einstein relation relating to these currents.
b) Explain Meissner effect. Discuss Type – I and Type – II super conductors with example.

**Code.No: NR - 10201** **Set No: 3**

6.a) What are dielectrics? Derive clausius Mosotti equation for solids.
b) Explain magnetic hysteresis on the basis of domain theory of ferromagnetism.

7.a) Explain the terms 'stimulated emission and population inversion'. Describe the working of semiconductor laser.
b) Explain the principle and working of optical fibres. What are the types of optical fibres? Explain.

8.a) Show that the Wave length of an accelerated electron by a potential difference of V volts is $\lambda = 1.227/\sqrt{V}$ nm.
b) Derive an expression for electrical conductivity in metals
c) Write a note on solar cells. Physical Constants (given) electron mass M = 9.1 X $10^{-31}$ kg, charge e = 1.6 × $10^{-19}$C planck's constant h = 6.63 × $10^{-34}$ Js, C = 3 × $10^{8}$ m/s, $\varepsilon_0$ = 8.85 × $10^{-12}$ F/m, Boltzman constant K = 1.38 × $10^{-23}$J/K.

**Code No: NR-10201.** **Set No:4**

**I Year-B.Tech. Regular Examinations, May/June-2004**
**APPLIED PHYSICS**
**(Common to Electrical and Electronics Engineering, Electronics and Communication Engineering, Computer Science and Engineering, Information Technology, Electronics and Instrumentation Engineering, Bio Medical Engineering, Electronics and Control Engineering, Electronics and Telematics, Electronics and Computer Engineering, Computer Science and Systems Engineering)**

**Time: 3 Hours** **Max. Marks: 80**

**Answer any FIVE questions**
**All questions carry equal marks**

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1.a) Explain metallic and Molecular type of bonding in solids with examples.
b) Describe the seven crystal systems with diagrams.

2.a) Obtain an expression for number of Frenkel defects in equilibrium at a temperature T.
b) Deduce Bragg's law of x- rays diffraction.
c) Sketch the following planes in a cubic unil cell viz. (001) (120) ($\bar{2}$ 11)

3.a) What are matter Waves? Explain G.P.Thomson's experiment in support of matter Waves.
b) Assuming the time independent schrodinger's Wave equation, discuss the solution for a partical in one dimensional potential well of infinite hight.

4.a) Distinguish between conductors, insulators and semiconductors on the basis of band theory of solids.
b) Discuss the motion of an electron in a periodic lattice.
c) Find the relaxation time of conduction electrons in a metal of resistivity $1.54 \times 10^{-8}$ Ωm, if the metal has $5.8 \times 10^{28}$ conduction electrons per $m^3$.

5.a) Distinguish between junction diode and Zener diode. Explain Zener break down.
b) Discuss the Meissner effect in super conductors. Mention a few applications of super conductors.
c) The band gap in germanium is 0.68 eV. Assuming that the number of electron – hole pair is proportional to exp(-Eg/2KT), find the percentage increase in the number of charge carriers, when the temperature is increased from 300K to 320K.

**Code.No: NR - 10201** **Set No:4**

6.a) What are dielectrics? Derive clausius Mosotti equation for solids.
b) Explain magnetic hysteresis on the basis of domain theory of ferromagnetism.

7.a) Explain the terms 'stimulated emission and population inversion'. Describe the working of semiconductor laser.
b) Explain the principle and working of optical fibres. What are the types of optical fibres? Explain.

8.a) Explain the physical significance of wave function.
b) Give an account of concept of effective mass.
c) An electron is bound in one dimensional box size 0.4nm. What will be its minimum energy. Physical constants (given) Electron mass m = $9.1 \times 10^{-31}$Kg charge e = $1.6 \times 10^{-19}$C, Planck's constant h = $6.63 \times 10^{-34}$ J.S, Velocity of light C = $3 \times 10^{8}$m/s, permittivity of vaccum $\varepsilon_o$ = $8.85 \times 10^{-12}$F/m, Boltzmann constant K = $1.38 \times 10^{-23}$J/K.