LAST MOMENT TUITIONS

APPLIED PHYSICS I

December 16

Computer Engineering (Semester 1)

Total marks: 80
Total time: 3 Hours

INSTRUCTIONS
(1) Question 1 is compulsory.
(2) Attempt any ***three*** *from the remaining questions.*
(3) Draw neat diagrams wherever necessary.

Q.1](a)What are crystal imperfections? Mention any two significance of it. (3)

Q.1](b)Write Schrodinger's time dependent and time independent wave equations of matter waves in one dimensional and state physical significance of these equations. (3)

Q.1](c)Craw the I-V characteristics of a photo-diode. What is meant by a dark current? (3)

Q.1](d)Define super conductivity and critical temperature. Plot the variation of resistance versus temperature in case of superconducting state of the material. (3)

Q.1](e)What is reverberation time? Discuss Sabine formula (3)

Q.1](f)State 'magnetostriction effect'. Mention any two applications of ultrasonic waves
(3)

Q.1](g)Calculate conductivity of a germanium sample if a donor impurity atoms are added to the extent to one part in 10^6 germanium atoms at room temperature.

Assume that only one electron of each atom takes part in conduction process

Given:-Avogadro's number=6.022×10^{23}atom/gm-mol

Atomic weight of Ge=72.6

Mobility of electrons=3800cm^2/volts sec

Density of Ge=5.32 gm/cm^3 (3)

Q.2](a)Describe with necessary theory the Davisson and German establishing wave nature of electrons.

Calculate the de-Broglie wavelength of an alpha particle accelerating through a potential difference of 200volts

Given:-mass of alpha particles=$6.68x10^{-27}$kg (8)

Q.2](b)Define the term drift current and mobility of a charge carriers. Calculate the current product in a germanium sample of area of cross section $1cm^2$ and thickness 0.01mm, when a potential difference of 2V is applies across it. (7)

Given:-the concentration of free electron in germanium is $2x10^{19}/m^3$ and mobilities of electrons and holes are 0.36 m^2/volts sec and 0.17 m^2/volts sec respectively.

Q.3](a) Draw and explain the unit cell of sodium chloride (NaCl) crystals. Determine effective number of NaCl molecules per unit cell an ordination number. (8)

Q.3](b) State applications of Hall effect. In a Hall effect experiment a potential difference of 4.5μV is developed across a foil of zinc of thickness 0.02 mm, when a current of 1.5A is carrying in a direction perpendicular to applied magnetic field of 2 tesla.

Calculate (a) Hall coefficient for zinc (b) Concentration of electrons (7)

Q.4](a)Discuss formation of cooper pairs and energy gap in superconductor on the basis of BCS theory.

(5)

Q.4](b) State any five factors affecting the acoustics of the building and give the remedies for each. (5)

Q.4](c) An ultrasonic pulse of 0.09 Hz. sends down towards the sea-bed 5 which returns after 0.55 sec. The velocity of ultrasonic waves in sea water is 1800 m/sec. calculate the depth of sea and wavelength of ultrasonic pulse
(5)

Q.5](a) How does the position of Fermi energy level changes with increasing doping concentration in p-type semi-conductors? sketch the diagram. (5)

Q.5(b) Explain analysis of crystal structure using Bragg's X ray spectrometer. (5)

Q.5](c) Find the minimum energy of neutron confined to a nucleus of size of the order of 10^{-14}m.

Given mass of neutron = $1.675x10^{-27}$ kg. (5)

Q.6](a) Calculate the critical radius ratio of an ionic crystal in ligancy -6. What is the maximum size of cation in ligancy-6 configuration, when size 0f anion is 2.02A°? (5)

Q.6](b)What do you mean by group and phase velocity? Show that the de- Broglie group velocity associated with the wave packet is equal to the velocity of the particle. (5)

Q.6](c) Explain the formation of potential barrier across the unbiased p-n junction region. (5)