B.E - First Year Bachelor of Engineering (CBCS Pattern) First Semester

1BEAB02 - Applied Physics-I

P. Pages : 2 **GUG/W/18/11466**

Time : Two Hours * 3 5 5 1 * Max. Marks : 40

Notes : 1. Due credit will be given to neatness and adequate dimensions.
2. Assume suitable data wherever necessary.
3. Illustrate your answers wherever necessary with the help of neat sketches.
4. Use of non programmable/scientific calculator permitted.

List of Constant

1) Planck's constant, $h = 6.634 \times 10^{-34}$ J.S.

2) Velocity of right, $c = 3 \times 10^{8}$ m / s.

3) Boltzmann constant, $k = 1.38 \times 10^{-23}$ J / K.
$= 8.61 \times 10^{-5}$ ev / k.

4) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

5) Mass of electron, $m = 9.1 \times 10^{-31}$ kg

6) Charge of α – particle $= 3.2 \times 10^{-19}$ C.

7) Mass of α – particle $= 6.68 \times 10^{-27}$ kg.

1. a) Using the concept of matter waves, obtain the Bohr's condition for quantization of angular momentum. **5**

b) In Compton effect, considering elastic collision between a photon and a free electron, write down the equation of energy and momentum conservation. **5**

c) The accelerating potential of an electron is charged from 1kV to 2kV. Determine the charge in wavelength of an electron. **4**

OR

2. a) Arrive at Heisenberg uncertainty principle with the help of simple thought experiments. **5**

b) Write down Schrodinger time dependent and time independent wave. Equations explain normalization condition of wave function. **5**

c) A electron is confined to move between two rigid walls separated by 1hm. Find the de-Broglie wavelength representing first allowed energy state of electron and the corresponding energies. **4**

3. a) Draw energy band diagram of n-type and p-type semiconductor at ok. **4**

b) In P-N junction diode, what are diffusion current and drift current. Explain the term Barrier potential. **5**

c) 14.1mA current flows through a forward biased PN junction at 200mV. Find revese saturation current in the junction at same temperature. Assume junction temperature to be 27ºC. **4**

OR

4. a) Draw the neat energy band diagram of PNP transistor in. **4**
i) Unbiased mode. ii) Biased mode.

b) What is Hall effect? Obtain an expression for Hall coefficient. **5**

c) Determine Barrier potential for a germanium junction at room temperature when both n and p region are doped to the extent of one atom per 10^6 germanium atoms. **4**
$\left(n_i = 2.5x10^{19} / m^3,\ N = 4.4x10^{28}\ \text{atoms}/ m^3\right)$.

5. a) Define. **5**
i) Unit cell. ii) Effective number of atoms per unit cell.
iii) Lattice point iv) Basis.
v) Packing fraction.

b) What are miller Indices? Draw miller planes for (001), (021), (121) and (102) places for simple cubic structure. **5**

c) Chromium has BCC structure. Its atomic radius is 0.1249nm. Calculate the free volume per unit cell. **3**

OR

6. a) Derive the relation between interplanar distance (d) and miller indices (hkl). **5**

b) Explain tetrahedral & octahedral void with the help of diagram. **4**

c) If x-rays of wavelength 0.5Aº are diffracted at an angle of 5º in the first order, what is the spacing between the adjacent planes of the crystal? At what angle will be the second maxima occurs? **4**

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