B.E. All Branches First Semester (C.B.S.) / B.E. (Fire Engineering) First Semester

Engineering Physics

P. Pages : 2 **NJR/KS/18/4337**

Time : Two Hours * 0 0 5 7 * Max. Marks : 40

Notes : 1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Due credit will be given to neatness and adequate dimensions.
7. Use of non programmable calculator is permitted.

List of Constant

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

Velocity of Light $c = 3 \times 10^{8}$ m|s

Charge of an electron $e = 1.602 \times 10^{-19}$ C.

Mass of an electron $m = 9.11 \times 10^{-31}$ kg

Avogadro's No. $N_A = 6.023 \times 10^{26}$ atoms / k mole

Boltzmann constant $k = 1.38 \times 10^{-23}$ J / k.

1. a) What is compton Effect? State the expression for compton shift. Explain the existence of modified component in compton scattering. **1+1+2**

b) Describe Davison – Germer experiment which supports the existence of matter waves. **4**

c) An X-ray photon of wavelength 0.3Aº is scattered through an angle of 45º by a loosely bounded electron. Find the wavelength of the scattered photon. **2**

OR

2. a) What is de Broglie hypothesis? Show that how the quantization of angular momentum follows from the concept of matter waves. **1+3**

b) Prove that a free electron cannot absorb a photon completely. **3**

c) A bullet of mass 50gm and an electron both travel with a velocity of 1200 m/s. What wavelength can be associated with them? **3**

3. a) Obtain an expression of quantized energy for an electron trapped in one dimensional potential well of infinite height of width "L". **4**

b) What do you mean by phase velocity & Group velocity? Obtain the relation between phase velocity and Group velocity. **3**

c) An electron has a speed of 400 m/sec with an accuracy of 0.001%. Calculate the uncertainty with which we can Locate the position of electron. **3**

OR

4. a) State Heisenberg's uncertainty principle. Describe a thought experiment to arrive at this principle. **4**

b) Show that electron can not exist inside the nucleus on the basis of uncertainty principle. **3**

c) An electron confined to move in one- dimensional potential well of width 7Aº. Find the quantized energy values for the three lowest energy states. **3**

5. a) Define: **3**
i) Unit cell
ii) Coordination number
iii) Void space.

b) Show that FCC structure has maximum packing fraction among all cubic unit cells. **4**

c) Lead crystallizes in FCC structure & it has a lattice constant of 4.95Aº. Calculate the interplanar spacing d_{110}, d_{111} and d_{220}. **3**

OR

6. a) Derive the relation between lattice constant and interplanar spacing in cubic unit cell. **4**

b) What are Miller Indices? Draw the planes (100) and (111) for simple cubic structure. **3**

c) Bragg angle corresponding to the first order reflection from the plane (111) in a crystal is 30º. When X-rays of wavelength 1.75 Aº are used, calculate interplanar spacing and lattice constant. **3**

7. a) Explain the phenomenon of Hall effect and obtain an expression for Hall voltage for the extrinsic semiconductor. **4**

b) Draw neat and clean energy band diagram of p-n junction diode in **3**
i) Unbiased condition and ii) Forward bias condition.

c) Calculate the value of Hall voltage if observed Hall coefficient 5 m^3/c for a current of 1mA flowing through the specimen of 20mm thickness placed suitably in a magnetic field of flux density 1.0 wb/m^2. **3**

OR

8. a) Explain the function of emitter, base and collector in a transistor. **3**

b) Discuss the classification of solids on the basis of forbidden energy gap. **3**

c) Draw energy band diagram of unbiased pnp transistor. **2**

d) If the emitter current is 6 mA and the collector current is 5.75 mA. Calculate the value of D. C. current gain in common base mode. **2**

****