SH-II/Electronics-202/C4/19

B.Sc. 2nd Semester (Honours) Examination, 2019

ELECTRONICS

(Applied Physics)

Paper : SH/ELC/202/C-4(T-4)

Course ID : 21712

Time: 1 Hour 15 Minutes **Full Marks: 25**

The figures in the right hand side margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any three* of the following: 1×3=3

(a) Give the statement of Heisenberg's Uncertainty Principle.

(b) What is Compton's effect?

(c) What do you mean by matter waves?

(d) What is Fermi-level of energy?

(e) What is an ideal crystal?

(f) Draw T-S indicator diagram for a Thermodynamic process.

2. Answer *any three* of the following: 2×3=6

(a) Express Plank radiation formula in terms of frequency (γ) of the radiation.

(b) Write down the expression for probability distribution function for B-E and F-D statistics.

(c) What is packing fraction (f)? Write down the value of packing fraction in fcc (Face Centred Cubic) crystal lattice.

(d) What is 'Miller indices'? What is its importance?

(e) To study crystal structure why are ordinary light sources not used? What type of radiation is commonly used for this purpose?

(f) Give Clausious statement towards the second law of thermodynamics.

3. Answer *any two* of the following: 5×2=10

(a) On the basis of quantum theory define (i) Eigenfunction (ii) Eigenoperator and (iii) Eigenvalues, with proper examples. Give the probabilistic interpretation of the wave function $\Psi(x,t)$. 3+2=5

(b) Give the p-v indicator diagram for an (i) isothermal process and for an (ii) indicator adiabatic process. Hence derive the expression for efficiency of a Carnot's engine (η) from p-v indicator diagram. (1+1)+3=5

(c) Discuss energy band theory of solids based on Kronig-Penny model. 5

(d) Derive an expression for the perpendicular separation d_{kkl} between an identical set of parallel planes. How many types of Bravis lattices are there in an orthorhombic crystal? 4+1=5

4. Answer *any one* of the following: 6×1=6

(a) Briefly discuss Debye's theory of specific heat of solids at low temperature. What is electronic specific heat? 5+1=6

(b) Derive an expression for the energy of an electron in its *n*th orbit in "particle in a one-dimensional box" problem. Hence, find the expression of wave function Ψ at the same orbit. 4+2=6

(c) Write short notes on the following: 2+2+2=6

(i) Co-valent bond

(ii) Thermal conductivity

(iii) Resistivity of Metals

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