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**PG CBCS**  
**M.Sc. Semester-I Examination, 2020**  
**PHYSICS**  
PAPER: PHS-102

**Full Marks: 40**

**Time: 2 Hour**

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**Write the answer for each unit in separate sheet**

The figures in the right-hand margin indicate full marks.  
Candidates are required to give their answers in their own words as far as practicable

**102.1: Quantum Mechanics-I**

**Marks: 10**

**Answer any TWO questions of the following:**

**10×2**

1. Discuss the difference between Schrödinger, Heisenberg and Interaction picture.
2. Explain how alpha decay is possible Quantum Mechanically.
3. Explain the non-existence of electron inside nucleus using uncertainty principle.
4. Describe the time evolution of position and momentum operator in Simple Harmonic Oscillator.
5. Find an expression of Momentum Representation of Simple Harmonic Oscillator system.
6. Calculate rms distance in the ground state of Hydrogen Atom.

*(Turn Over)*

(2)

**102.2: Solid State-I****Marks: 10****Answer any TWO questions of the following:****10×2**

1. (a) What are point group and space group? Give their number for two or three dimensional Lattices.  
(b) Explain Bragg's Law and discuss its significance. **(5+5=10)**
2. What do you mean by miller indices? Briefly explain the concept of reciprocal lattice. Write short note HCP structure. **(5+5=10)**
3. With proper diagram explain Ewald's construction. What is the important of Brillions Zone? **(5+5=10)**
4. Describe the concept of structure factor and atomic form factor.  
Calculate the angle which [111] direction of a cubic lattice makes with [100] directions. **(7+3=10)**
5. (a) What are Bloch functions? Explain the origin of allowed and forbidden bands for electrons in solids.  
(b) Describe the extended zone scheme and reduced zone scheme for representing  $E-K$  relationship. **(5+5=10)**
6. Derive dispersion relationship for a one-dimensional atomic crystal and discuss the nature of acoustic and optical modes. Show that the group velocity vanishes at the zone boundary.

**10**

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