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UTTARAKHAND OPEN UNIVERSITY, HALDWANI (NAINITAL)  
उत्तराखण्ड मुक्त विश्वविद्यालय, हल्द्वानी ( नैनीताल)

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M.Sc. Physics (MSCPHY12)

First Year Assignment

Last Date of Submission: 15 May 2014

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Course Title: Solid State Physics

Course Code: PHY-503

Year : 2013-14

Maximum Marks :40

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### Section A

Section A contains 08 short answer type questions of 5 marks each. Students are required to answer 4 questions only. Answers of short answer type questions should be 250 words approximately.

- 1- Define 14 lattice types in three dimensions. Draw structures of simple crystal structures (NaCl, CsCl, hpc, Diamond )
- 2- Prove that the diffraction condition in reciprocal lattice system is
$$2k \cdot G + G^2 = 0$$
- 3- What is Lennard-Jones potential? Find the expression for it.
- 4- Define quantization of elastic waves, phonon momentum, and inelastic scattering by phonons.
- 5- Explain the effect of temperature on the Fermi- Dirac distribution and find out the heat capacity of electron gas.
- 6- What are direct absorption process and indirect absorption process in semiconductor crystals? Define effective mass and its physical significance.
- 7- Derive London Equation and define London penetration depth and coherence length.
- 8- Explain NMR, EPR or ESR.

## **Section B**

Section B contains 04 long answers type question of 10 marks each and students are required to answers 02 questions only.

- 1- Define phonon heat capacity and Debye modal for density of state. Find out expression for heat capacity of solids by Debye model and Einstein models.
- 2- Give the BCS theory of superconductivity and explain Josephson dc and ac effects.
- 3- What are diamagnetism, paramagnetism and ferromagnetism? Give the quantum theories of diamagnetism, paramagnetism.
- 4- Define Plasmons, Polaritons and Polarons. Find out the LST relation.