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

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M.Sc. Physics (MSCPHY13)

First Year Assignment

Last Date of Submission: 15 May 2016

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Course Title: Solid State Physics

Course Code: PHY-503

Year : 2015-16

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- Explain the concept of Miller indices. Write the Miller indices of the six cubic planes and four body diagonals. With the help of a neat diagram show a (110) plane in a cube.
- 2- What are color centers? How are they produced? Explain the properties exhibited by F centers in ionic crystals.
- 3- Explain the principle of neutron diffraction. What are the application and limitations of neutron diffraction? Compare electron diffraction with X-ray diffraction.
- 4- Explain the conduction mechanism in ionic crystals. Arrive at the Einstein's relation between the ionic conductivity and diffusion.
- 5- What are grain boundaries? Explain low angle twin and twist boundaries with the help of neat diagrams.
- 6- Explain the concept of Fermi level in case of an intrinsic semiconductor. Show that the Fermi level lies exactly in between the top of valance band and bottom of conduction band in case of intrinsic semiconductor.
- 7- Explain the working of Nd:YAG laser and give its importance and application.
- 8- What are Brillouin zones?

## **Section B**

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

- 1- Discuss the motion of an electron in a one dimensional periodic potential using Kronig Penney model. What it meant by energy.
- 2- Explain various vibrational modes of diatomic chain of identical atoms under periodic boundary conditions.
- 3- Explain the Debye Model of heat capacity.
- 4- What is dielectric constant? Explain the different techniques of dielectric measurements. Give some idea about dielectric materials.