# EASTERN UNIVERSITY, SRI LANKA

## THIRD EXAMINATION IN SCIENCE - 2005/2006

## SECOND SEMESTER (SPECIAL REPEAT)

## PH 304 CONDENSED STATE PHYSICS

Time: 01 hour.

Answer ALL Questions

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1. Define Bravais lattice, Primitive unit cell, Conventional unit cell, Lattice constant and Basis. Define reciprocal lattice and find the reciprocal lattice of the simple cubic lattice. Show that the reciprocal of a reciprocal lattice is the corresponding direct lattice.

   Show that for any cubic lattice the separation of the planes corresponding to Miller indices (*hkl*) is given by

   $$d_{hkl} = \frac{a}{\sqrt{h^2+k^2+l^2}}$$ , where $a$ is the lattice parameter.

   Molybdenum crystallizes as b.c.c and the lattice parameter is 0.315 nm. Calculate

   (a) the nearest distance between the centres of two atoms.

   (b) the density

   (c) the distance between successive (110) planes and

   (d) the angle between the [112] and [113] directions

   The atomic weight of molybdenum is 95.94

2. Briefly describe the Bragg's diffraction in crystals and show that the Bragg condition for crystal diffraction on (hkl) planes is

   $2d_{hkl}sin\theta_{hkl} = n\lambda$, where the symbols have their usual meanings.

   Determine the Bragg angles for the (111), (220), (311), and (400) reflections of germanium which has a cubic structure with lattice parameter 5.65 $A°$ using "Copper Kα" X-rays ($\lambda = 0.154$ nm).