Menoufia University **Faculty of Engineering, Shebin El-Kom** **Basic Engineering Science Department** **2nd Semester Examination,2015-2016** **Date of Exam: 11 / 6 / 2016**	**Subject: Solid state theory** **Code: BES633** **Year: Postgraduate (Engineering Physics)** **Time Allowed : 3 hours** **Total Marks : 100 marks**

Answer the following questions.

Question 1 (20 marks)

a) Compare Bragg's equation with those of Laue and show that they are equivalent.

b) X-rays are incident from (111) planes of a single cube crystal with a lattice parameter of 0.2nm. The first order maximum is observed in the direction of 87° to the incident ray. Calculate the Bragg angle and the wavelength of the x-rays.

Question 2 (20 marks)

Calculate the atomic packing factor (APF) and coordination number for: i) Simple cubic lattice, ii) Body centered cubic lattice and iii) Face centered cubic lattice.

Question 3 (25 marks)

In view of band theory of solids, clarify the difference between direct and indirect band gap semiconductors?

Question 4 (20 marks)

According to band theory of solid, distinguish between the types of solids with explaining the influence of the band energy diagram of each type in their electrical properties?

Question 5 (15 marks)

Write short notes on:

i. Generation of charge carriers
ii. Recombination of charge carriers
iii. Carriers movement in equilibrium through P-N junction diodes

With my Best Wishes