

Uva Wellassa University, Sri Lanka  
End Semester Examination – February 2011  
SCT 445-2 Semiconductors and Nanomaterials



Time: Two (02) hours

NO

PART - B

4) a. Draw the schematic of possible energy band structures for conductors, insulators and semiconductors. Compare and contrast it.

b. A schematic of conduction and valence band density of states of a pure semiconductor at low temperature is shown in Fig.01 along with the position of a Fermi level (All symbols have their usual meaning).

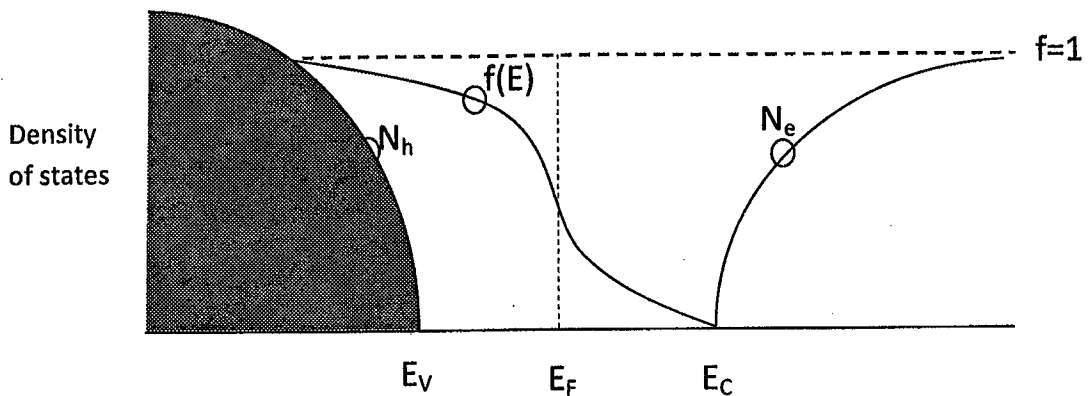


Fig.01

- i. Explain the effect of temperature for intrinsic carrier concentration.
- ii. Draw the schematic of density of states and Fermi function of a pure semiconductor at high temperature.
- iii. Explain the effect on adding donor impurity atoms and acceptor impurity atoms.
- iv. Draw the schematics of density of states and Fermi function of n-type and p-type semiconductor.

(25 marks)

5) a. Briefly describe the electron and hole motions in a p-n junction for forward and reverse biases; then explain how these leads to rectification.

b. Write down two physical mechanisms give rise to the reverse bias breakdown in a p-n junction. Briefly explain one of them.

c. Using relevant schematics and graphs, briefly explain the principle of operation of an n-p-n transistor.

(25 marks)