

**FEDERAL UNIVERSITY OF TECHNOLOGY OWERRI,
POSTGRADUATE SCHOOL**
HARMATTAN SEMESTER EXAMINATION (M.Eng) SESSION: 2016/17
COURSE: PHYSICS OF SEMICONDUCTORS CODE: EEE 877 TIME: 3RS

SECTION A

Answer Questions 1 to 4 and any other 3 questions

1. Define the terms: hole, energy gap, conduction band and intrinsic semiconductor.
2. Explain why the energy levels of an atom become energy bands in a solid
3. 'Extrinsic Semiconductors are a typical equivalents to Electronic Components, of today'. Discuss.
4. Describe briefly, the Acceptor-Donor mechanism.
5. Show that $W_n = -\frac{q^4 m}{8\epsilon_0^2 h^2 n^2}$ of hydrogen atom.
6. Time Independent Schrodinger Equation (TISE) is an analytical sure proof for particle-wave duality in classical mechanisms. Demonstrate the proof.
7. State the Pauli Exclusive Principles. Hence, with Fermi-Dirac quantum statistics, determine the two possibilities that exist at temperature 0°K , of $f(E)$ when i.) $E \gg E_F$ ii.) $E \ll E_F$; at $E = E_F$ being 50 %.
8. How can 'table salt' be justified to be an insulator? Can we vividly say same for 'G-Salt' (PhCl_3)? Using the following properties: nature of stability, charges or ions, and type of bonding, among others, verify the allegation.

SECTION B

Answer all questions

1. Describe the process of generation and recombination in a semiconductor. Discuss the band gap of semiconductors? Give examples of each. What do the following terms mean: (i) Junction breakdown (ii) Zener breakdown, (iii) Avalanche breakdown, (iv) PN junction capacitance.
2. Discuss the PN junction in both biased and unbiased situations. What does it mean to be forward biased or reverse biased? Use diagrams to illustrate your answers.
3. What are intrinsic and extrinsic semiconductors? What is a photon? Describe the photoelectric effect. Describe the Schottky effect. What are the advantages and disadvantages of a Schottky diode?