**NNAMDI AZIKIWE UNIVERSITY**

**FACULTY OF ENGINEERING**

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

**2014/2015 EXAMINATION (2ND SEMESTER)**

**COURSE CODE: ECE 326 COURSE TITLE: PHYSICAL ELECTRONICS** TIME: 21/2Hrs

***SECTION A: Attempt Question 1 and any other 2 questions from this section***

1. a) What do you understand by the following terms

i) Diffusion current

ii) Drift current

iii) Mean free path

b) Prove that the current density (J) is the product of charge density (ρ) and drift velocity (v)

c) Differentiate diagrammatically the energy band of a p-type semiconductor and an n-type semiconductor

2. a) State mass action law

b) Show diagrammatically, the mechanism of the conduction of electricity which does not involve free electrons.

c) A wire has a current density of 6.67 x 106A/m2. If the volume occupied by the electron is 5mm3 and the length of the conductor is 3.55mm, what current does the wire carry?

3. a) State the electron gas theory of a metal

b) Mathematically state the relationship showing that intrinsic concentration varies with temperature

c) Supposing that p in an intrinsic semiconductor is 2.5x1013, find p in an n-type semiconductor given that donor ion concentration is 6.0x1017

4. a) Define the terms doping

b) Give two main reasons for doping intrinsic semiconductors

c) Given that ni for germanium at 300k is 5.5x1020 and NA = 6.01x1013. Find np

***SECTION B: Attempt any two questions from this section***

1. a) State Bohr’s three postulates of the atom.

b) What do you understand by the word “photon”?

c) Define (i) photoexcitation (ii) photo ionization

2. a) Explain why a semiconductor acts as an insulator at 0K and why its conductivity increases with increasing temperature.

b) What is the difference between an intrinsic and extrinsic semiconductor?

c) What do you understand by a hole in a semiconductor?

3. a) Define the following:

i) Mobility

ii) Conductivity.

b) Explain briefly Hall Effect.

c) What do you understand by Donor and Donor Impurities?