ELIZADE UNIVERSITY ILARA MOKIN, ONDO STATE

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST SEMESTER EXAMINATION, 2020/2021 ACADEMIC SESSION

COURSE TITLE: SOLID STATE ELECTRONICS

COURSE CODE: EEE 521 (2-units)

EXAMINATION DATE:

COURSE LECTURER: DR T. O. ALE

HOD's Signature

TIME ALLOWED: $1\frac{3}{4}$ HOURS

INSTRUCTIONS:

1. *ANSWER QUESTION 1 AND ANY OTHER 2 QUESTIONS.*
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.
3. YOU ARE NOT ALLOWED TO BORROW ANY WRITING MATERIALS AND CALCULATORS DURING THE EXAMINATION.
4. SMART WATCHES ARE NOT ALLOWED IN THE EXAMINATION HALL

QUESTION 1

(a) With aid of a neat, well labelled diagram of an Energy band, describe the following extensively: i. Conductor
ii. Semiconductor
iii. Insulator   (9 marks)

(b) Show by derivation how electrical conductivity of a material can be controlled by the number of the charge carrier in the material or the charge carrier mobility. **(5 marks)**

(c) Why is transistor useful in electrical signal amplification?   (4 marks)

(d) With a clear neat diagram, show the band structure of a metal and a p-type semiconductor before and after contract is made.   (8 marks)

(e) Why are some semiconductors called group IV elements?   (4 marks)

QUESTION 2

(a) Differentiate between Intrinsic and Extrinsic semiconductor.   (4 marks)

(b) State two (2) reasons why a semiconductor must be inform of single crystal. **(4 marks)**

(c) Consider an extrinsic semiconducting crystal oriented as shown in Fig Q2. The application of an electric field E_x = +62.5 V/m and a magnetic field B_z = +1 Wb/m² causes a positive current density J_x = 3.0 x 10^4 A/m² and a positive Hall voltage E_y = +18.7 V/m. (The positive y face of the crystal becomes negatively charged.) Determine the sign and density of the carriers in this semiconductor, and compute the mobility of these carriers. Given $|e| = 1.6 \times 10^{-19}$.   (7 marks)

Fig. Q2
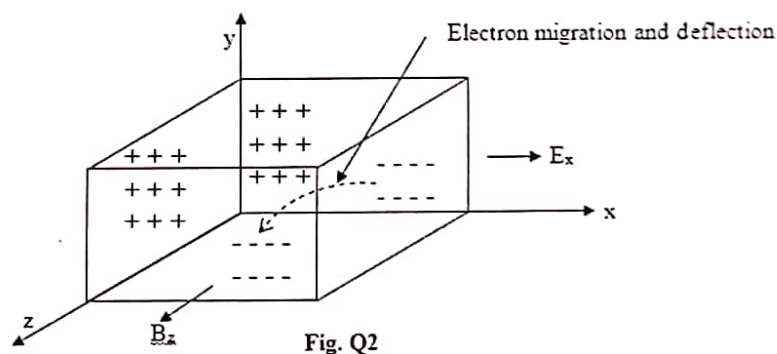
QUESTION 3

(a) Explain fig Q3a as it relates to Electrical characteristics of p – n junction   (6 marks)