(Knowledge for Development)

KIBABII UNIVERSITY

(KIBU)

UNIVERSITY EXAMINATIONS

2020/2021 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS

YEAR FOUR SEMESTER TWO EXAMINATIONS

FOR THE DEGREE OF

(COMPUTER SCIENCE)

COURSE CODE: **CSC 456E**

COURSE TITLE: **SEMICONDUCTOR DEVICES**

DATE: 30/09/2021 **TIME:** 02.00 P.M – 04.00 P.M

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO (2) QUESTIONS

QUESTION ONE (COMPULSORY) [30 MARKS]

a) With a suitable example outline **THREE** types of particles in the atomic structure of semiconductor elements [6mks]

b) Discuss **THREE** different classes of materials in relation to electrical properties [6mks]

c) Differentiate between passive and active component structures [2mks]

d) Discuss **THREE** categories of contamination in cleanroom where modern semiconductor manufacturing is performed. For each contamination outline the control mechanism employed.[6mks]

e) Explain the following terms as used in semiconductor device processing technology:

i) Oxidation [2mks]

ii) Diffusion [2mks]

iii) Deposition [2mks]

f) Outline the steps used in the preparation of Si-wafers. [4mks]

QUESTION TWO [20 MARKS]

a) Discuss any **THREE** key trends in semiconductor fabrication process [6mks]

b) Outline **TWO** processes involved in photolithography. [4mks]

c) Describe Czochralski method of growing monocrystal ingots [4mks]

d) Outline **THREE** crystal defects in silicon [6mks]

QUESTION THREE [20 MARKS]

a) What are the basic processes involved in fabricating ICs using planar technology? [10mks]

b) Distinguish between dry etching and wet etching. [5mks]

c) Outline **FIVE** major CMOS technology used to describe wafer fabrication process [5mks]

QUESTION FOUR [20 MARKS]

a) i) Outline the differences between diffusion and ion-implantation. Why has ion-implantation become largely used? [6mks]

ii) Outline **THREE** side effects of ion implantation on the substrate material. [3mks]

iii) Explain how the side effect in ii) is resolved. [3mks]

b) i) Describe the term "epitaxy" as used in semiconductor device manufacturing [2mks]

ii) Outline **TWO** epitaxy growth methods [4mks]

c) Outline **TWO** IC packaging techniques [2mks]

QUESTION FIVE [20 MARKS]

a) What are the advantages of ion implantation technique? [4mks]

b) Discuss Tape Automated Bonding as an interconnect attachment technique [4mks]

c) Outline **THREE** requirements for a good integrated circuit packaging [6mks]

d) Outline **THREE** functions of IC packaging [6mks]