Kasarani Campus
Off Thika Road
Tel. 2042692 / 3
P. O. Box 49274, 00100
NAIROBI
Westlands Campus
Pamstech House
Woodvale Grove
Tel. 4442212
Fax: 4444175

KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2024/2025 ACADEMIC YEAR
FIRST YEAR, FIRST SEMESTER EXAMINATION
FOR THE BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY
KCS 2203 ANALOGUE ELECTRONICS

Date: 13TH AUGUST 2024
Time: 8:30AM – 10:30AM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

a) Define semiconductor. **(2 Marks)**

b) There are two types of extrinsic semiconductor, name them and briefly explain how each of them is formed. **(6 Marks)**

c) Using a suitable sketch diagram, explain functioning of a photodiode. **(6 Marks)**

d) An intrinsic semiconductor is unable to conduct electricity at absolute zero temperatures. Explain two ways in which you can increase the conductivity of this intrinsic semiconductor. **(4 Marks)**

e) Explain why trivalent impurities are referred to as acceptor impurities. **(4 Marks)**

f) A certain transistor has a β_{DC} of 200. Determine the collector and emitter currents given that the base current is 50 μA. **(4 Marks)**

g) Define a PN Junction and Explain how a depletion layer is formed between two PN junction when the junction is subjected to some voltage source. **(4 Marks)**

QUESTION TWO (20 MARKS)

a) Using the concept of atomic structure and energy bands, explain how conduction of electricity happens in solids. **(6 Marks)**

b) Using a sketch diagram, illustrate and explain what is transistor biasing in terms of forward bias and reverse bias in p-n junction. **(6 Marks)**

c) Explain the differences between p-type and n-type semiconductor based on the following parameters.

i) Nature of impurity added. **(2 Marks)**

ii) Type of impurity added. **(2 Marks)**

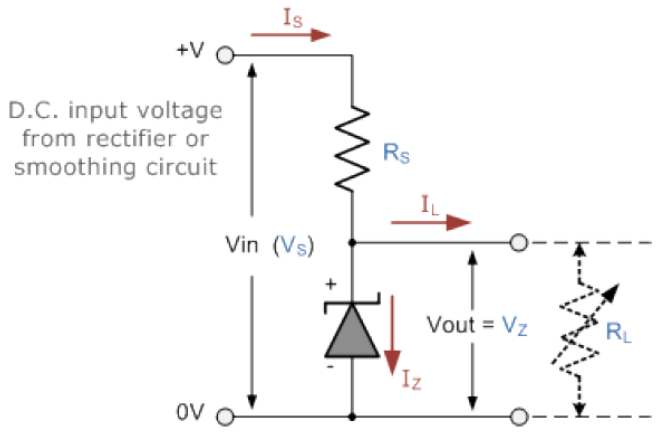
iii) Minority & majority charge careers. **(2 Marks)**

iv) Density of electrons & holes**.** **(2 Marks)**

QUESTIONS THREE (20 MARKS)

a) Tunnel diode is one of the major pn junction diodes, using suitable diagrams, explain the tunneling effect of a tunnel diode. **(10 Marks)**

b) The figure below shows a zener diode regulator circuit.



A 20.0V stabilized power supply is required to be produced from a 24V DC power supply input source. The maximum power rating P_Z of the zener diode is 4kW. Using the zener regulator circuit above calculate.

i) The maximum current flowing through the zener diode. **(4 Marks)**

ii) The minimum value of the series resistor, R_s **(4 Marks)**

iii) The zener current I_Z at full load. **(2 Marks)**

QUESTION FOUR (20 MARKS)

a) Transistor is one of the basic building blocks of modern electronics. It is composed of semiconductor material, usually with three terminals for connection to an electronic circuit. Briefly explain the two main types of field effect transistor(FET). **(8 Marks)**

b) Explain the three operating regions of a Metal oxide semiconductor field effect transistor (MOSFET). **(6 Marks)**

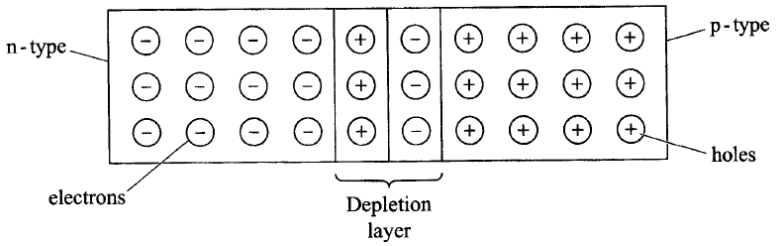
c) With a suitable and well labeled diagram, explain common base configuration(CB) in a transistor amplifier. **(6 Marks)**

QUESTION FIVE (20 MARKS)

a) Derive the relationship between DC Beta (β_{DC}) and DC Alpha (α_{DC}) of a transistor. **(8 Marks)**

b) A certain transistor has a β_{DC} of 250. Determine the collector and emitter currents given that the base current is 10 µA. **(6 Marks)**

c) The figure below shows a depletion layer in an unbiased p-n junction.



Show how a battery can be used to widen the depletion layer of the transistor. **(6 Marks)**