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KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2023/2024 ACADEMIC YEAR
SECOND YEAR, FIRST SEMESTER EXAMINATION
FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE
KCS 203 – ELECTRONICS

Date: 11TH December 2023
Time: 2:30PM – 4:30PM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

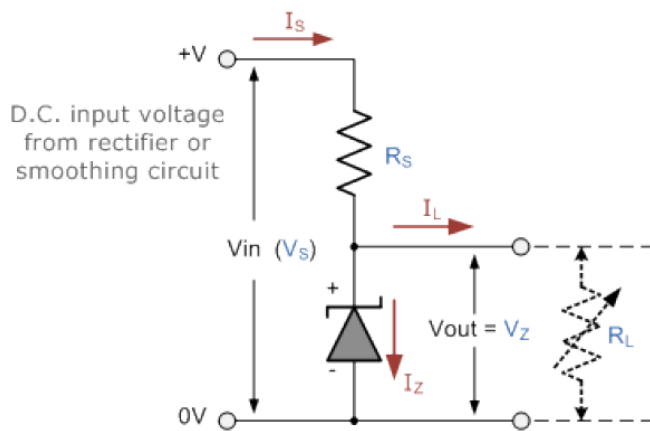
- a) Using examples explain the difference between a semiconductor and a good conductor. (4 Marks)
- b) P- type and N-type semiconductors are made from a pure semiconductor by a process known as “doping”.
- i) Define doping (2 Marks)
- ii) Explain how doping produces an n-type semiconductor. (4 Marks)
- c) Explain what is meant by donor and acceptor impurities in semiconductors. (4 Marks)
- d) Define diode, and give four applications of zener diode (6 Marks)
- e) 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 transistor. (6 Marks)
- f) State two advantages and two disadvantages of MOSFET? (4 Marks)

QUESTION TWO (20 MARKS)

- a) Using a diagram, illustrate the difference between forward bias and reverse bias in p-n junction. (6 Marks)
- b) Explain what happens to depletion layer of a p-n junction diode when the diode has been reverse biased. (4 Marks)
- c) Define tunnel diode, using a well labeled diagram briefly discuss tunneling effect in tunnel diodes. (6 Marks)
- d) Explain the effect of temperature on extrinsic semiconductor. (4 Marks)

QUESTIONS THREE (20 MARKS)

- a) Discuss the differences between intrinsic and extrinsic semi-conductor materials. (6 Marks)
- b) The figure below shows a zener regulator circuit.



A 10.0V stabilized power supply is required to be produced from a 12V DC power supply input source. The maximum power rating P_Z of the zener diode is 2kW. 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 load current I_L if a load resistor of $1k\Omega$ is connected across the zener diode. (4 Marks)
- iv) The zener current I_Z at full load. (2 Marks)

QUESTION FOUR (20 MARKS)

- a) There are three configuration characteristics of a bipolar junction transistor, using a well labelled diagram explain common emitter and common collectors configurations (10 Marks)
- b) Explain the following operation regions of a Metal Oxide Sem-conductor Field Effect Transistor(MOSFET).
 - i) Cut-off region
 - ii) Saturation region
 - iii) Ohmic region (6 Marks)
- c) A transistor has a β_{DC} of 250 and a base current, I_B , of $10\mu A$. Calculate the collector current, I_C (4 Marks)

QUESTION FIVE (20 MARKS)

- a) Draw a circuit diagram showing the depletion layer of a p-n junction diode connected in the reverse bias mode. (4 Marks)
- b) State the reason why increasing the external voltage in (a) above makes the depletion layer wider. (2 Marks)
- c) Explain the meaning of breakdown voltage of a junction diode. (4 Marks)
- d) Explain the following operation modes in Bipolar Junction Transistor (BJT).
 - i) Cut-off mode
 - ii) Saturation mode (4 Marks)
- e) Explain the differences between p-type and n-type semiconductors based on the following three factors.
 - i) Type of impurity added.
 - ii) Majority and Minority charge carriers.
 - iii) Density of electrons/holes. (6 Marks)