



# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.

Tel: +254(0) 799 529 958, +254(0) 799 529 959, +254 (0)712 524 293

Website: [www.must.ac.ke](http://www.must.ac.ke) Email: [info@mucst.ac.ke](mailto:info@mucst.ac.ke)

## UNIVERSITY EXAMINATIONS 2022/2023

THIRD YEAR, FIRST SEMESTER SPECIAL/SUPPLEMENTARY EXAMINATION FOR  
DEGREE OF BACHELOR OF SCIENCE IN MATHEMATICS AND PHYSICS AND  
BACHELOR OF EDUCATION SCIENCE

### SPH 3303: ELECTRONICS I

DATE: AUGUST 2023

TIME: 2 HOURS

INSTRUCTIONS: Answer Question ONE and any other TWO questions.

#### QUESTION ONE (30 MARKS)

- State the types of transistors (2 Marks)
- State the role of clapping in semi conductors (5 Marks)
- A transistor has a collection current of 2mA. If the current gain is 135. calculate the base current. (5 Marks)
- State three uses of a Zener diode (3 Marks)
- Differentiate between p-type and n-type semi-conductors. (5 Marks)
- Define the following terms
  - Forbidden gap (2 Marks)
  - Depletion layer (2 Marks)
- Show that the gain of an inverting amplifier is given by  $A_u = \frac{-R_f}{R_1}$  where  $R_f$  is the feedback resistance. (6 Marks)

#### QUESTION TWO (20 MARKS)

- State the factors that should be put into consideration when biasing a transistor. (4 Marks)

- b) A transistor has a collector current of 10 Ma and a base current of  $40\mu A$ . Calculate the current gain of the transistor. (5 Marks)
- c) For a N-channel *JFET*,  $I_{DSS} = 8.7mA$ ,  $V_p = -3V$ ,  $V_{eS} = -IV$ . Find
- $I_D$  (3 Marks)
  - $g_{mo}$  (3 Marks)
  - $g_m$  (3 Marks)
- d) Name two types of field effect translators (2 Marks)

### QUESTION THREE (20 MARKS)

- a) Define the following terms
- Conduction bond (2 Marks)
  - Doping (2 Marks)
- b) What is a p-n junction? (3 Marks)
- c) Differentiate between Zones and avalanche effects in diodes. (4 Marks)
- d) With the aid of a graph, explain the variation of current with voltage for a forward-biased diode. (6 Marks)
- e) State three uses of zoner diodes (3 Marks)

### QUESTION FOUR (20 MARKS)

- a) What is a virtual ground of an operational Amplifier? (3 Marks)
- b) Design a circuit showing how an OP-AMP can be used as:
- Non-Inverting Amplifier (3 Marks)
  - Inverting Amplifier (3 Marks)
- c) A C-E connected transistor has  $\beta = 100$  and  $I_B = 50\mu A$ . Find  $\alpha$ ,  $I_C$  and  $I_e$ . (6 Marks)
- d) Differentiate between ionic and covalent bonding in solids. (5 Marks)