



# MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR FIRST TERM EXAMINATION FOR

CERTIFICATE IN MECHANICAL ENGINEERING

AUTOMOTIVE ENGINEERING

1601/102, 1602/102: ENGINEERING PRINCIPLES

DATE: 10/6/2021

TIME: 11.30-2.30 PM

---

## INSTRUCTIONS

(i) *Do all given Questions*

(ii) *Neat work required*

## QUESTION ONE

- a) Define the following quantities
- Semi – conductors
  - Intrinsic semi-conductors
  - Extrinsic semi – conductors
  - Conductors
  - Insulators (10 marks)
- b) With aid of labeled diagrams explain
- Half – wave rectification (8 marks)
  - Full – wave rectification (2 marks)
- c) State any applications of circuits in Q1 (b) (2 marks)

## QUESTION TWO

- a) A transistor is used as an amplifying circuit. Show how it operates (5 marks)
- b) Explain the **THREE** classes of operation in Amplifiers (12 marks)
- c) Mention any **THREE** applications of Amplifiers (3 marks)

### QUESTION THREE

a) Define the following terms:

- i. Resistance
- ii. Capacitance

(4 marks)



b) Figure 1 shows an electric circuit. Determine

- i. Total resistance of the circuit
- ii. Current flowing through R<sub>2</sub>
- iii. Voltage drops across R<sub>3</sub>
- iv. Power dissipated across R<sub>1</sub> resistor
- v. Energy absorbed by resistor 4 Ω if the circuit is switched ON for 10 seconds

(10 marks)

- vi. With aid of circuit diagram and reverse characteristics, describe the operation of PN junction diode

(6 marks)

### QUESTION FOUR

- a) Show the charging and discharging curves for capacitors (4 marks)
- b) State **THREE** factors that determine the capacitance of a capacitor (3 marks)
- c) Differentiate between an NPN and a PNP transistor (3 marks)
- d) Two resistors of 6Ω and 4Ω are connected in series and parallel respectively across a supply voltage of 10V

- i. Draw the circuit
- ii. Calculate total resistance in each case
- iii. Determine the current supplied from the battery in each case (10 marks)

#### **QUESTION FIVE**

- a) With aid of diagrams explain the constant voltage method of charging a battery (5 marks)
- b) Explain the construction and operation of a light emitting diode (LED) (7marks)
- c) Describe a cathode ray oscilloscope (CRO) (8 marks)