



# MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

CERTIFICATE IN ELECTRICAL AND ELECTRONIC ENGINEERING (TVET)

ELECTRICAL MEASUREMENTS

DATE: 15/4/2019

TIME: 2.30-5.30 PM

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## INSTRUCTIONS:

Answer question one and any other two questions

### QUESTION ONE (30 MARKS)

- a)
  - i Explain what is meant by a measurement (4 marks)
  - ii State any two advantages of SI units (2 marks)
- b) Explain how each of the following error can be minimized
  - i. Systematic
  - ii. Zonal drift (6 marks)
- c) Describe the following types of maintenance programs
  - i. Breakdown
  - ii. Preventive
  - iii. Shut down (6 marks)
- d)
  - i Differentiate systematic error from static error (6 marks)
  - ii An ammeter reads 40.2A instead of 39.8A. Calculate
    - i) The Static Error
    - ii) The Percentage Error (6 marks)

### QUESTION TWO (20 MARKS)

- a)
  - i Explain how null instruments measure resistances. (6 marks)

- ii In a Wheatstone bridge circuit, calculate the unknown resistor R given that  $R_1 = 40\ \Omega$ ,  $R_2 = 50\ \Omega$  and  $R_3 = 20\ \Omega$  named clockwise (7 marks)
- b) An electrical motor provides an output power of 318kw. The electrical losses are found to be 40kw and the friction and windings loss is 8kw. Calculate the mechanical input to the motor and its overall efficiency. (7 marks)

### QUESTION THREE (20 MARKS)

- a) Define
  - i. Measurement
  - ii. Tolerance
  - iii. Hysteresis
  - iv. Sensitivity
  - v. Constancy (6 marks)
- b) i Explain 3 reasons for regularly lubricating machines. (4 marks)
- ii Explain what primary units means in measurements. (3 marks)
- c) Explain, using a diagram, how a deflection type of instrument operates. (7 marks)

### QUESTION FOUR (20 MARKS)

- a) Explain what is meant by a multiplier in a circuit (6 marks)
- b) Explain how a galvanometer can be converted to measure a
  - i. Current
  - ii. Voltage (6 marks)
- c) Show that, for a loaded potentiometer, the relationship between output and input voltage is linear. (8 marks)

### QUESTION FIVE (20 MARKS)

- a) State 4 advantages of planned preventive maintenance (4 marks)
- b) There are 3 classified categories of drifts. Explain them. (6 marks)
- c) A  $10\ \Omega$  galvanometer with a full scale deflection of 5mA is used to a current of 100A. Calculate
  - i. The value of the shunt resistance needed.
  - ii. If it were to be converted to a voltmeter to measure up to 50V calculate the required multiplier value needed. (10 marks)