



# THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

*Faculty of Applied & Health Sciences*

DEPARTMENT OF PURE AND APPLIED SCIENCES

**DIPLOMA IN SCIENCE LABORATORY TECHNOLOGY (DSL10S)**

**END OF SEMESTER EXAMINATION**

**EHE 2140: INSTRUMENTAL FAULT DIAGNOSIS AND MAINTENANCE I**

**SERIES: AUGUST/SEPTEMBER 2011**

**TIME: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer booklet*

This paper consists of **FIVE** questions. Answer question **ONE (COMPULSORY)** and choose any other **TWO** questions

This paper consist of **THREE** printed pages

### QUESTION ONE – (30 MARKS)

- a) (i) Define the following terms as applied to testing instruments
- (a) Static sensitivity
  - (b) Accuracy
  - (c) precision (6 marks)
- (ii) Distinguish between static and dynamic characteristics of a test instrument (4 marks)
- b) State **THREE** advantages and **TWO** limitations of a permanent magnet moving coil ammeter and voltmeter. (5 marks)
- c) (i) State **FOUR** characteristics of test signals (4 marks)
- (ii) Explain the use of test signals (2 marks)
- d) (i) The T-type attenuator shown in figure 1.0 has an input resistance of  $R_o$  when a resistance of  $R_o$  is connected across the output terminals. Determine the value of  $R_o$  (4 marks)
- (ii) If a constant signal source of amplitude  $V$  is applied at the input terminals, determine the output signal amplitude when the output terminals are:
- I) Open circuit (2 marks)
  - II) Terminated in a resistance of  $R_o$  (3 marks)
- OUTPUT

Fig. 1.0

### QUESTION TWO – 20 MARKS

- a) (i) Explain the term “instrument calibration” (2 marks)
- (ii) Outline the steps for calibrating an instrument (8 marks)

- b) With the aid of a diagram, explain the operation of the attraction type moving iron instrument (6 marks)
- c) Differentiate between the direct and indirect types of thermocouple ammeters (4 marks)

### QUESTION THREE – 20 MARKS

- a) Explain the disadvantages of using a potential divider network over a T-network in reducing the level of an a.c. signal (2 marks)
- b) With the aid of block diagram, explain the operation of a crystal calibrator (8 marks)
- c) State **FOUR** characteristics of an audio frequency signal source (4 marks)
- d) Explain **THREE** errors associated with signal source generators (6 marks)

### QUESTION FOUR – 20 MARKS

- a) State **FOUR** uses of a cathode ray oscilloscope (4 marks)
- b) List **THREE** advantages of a cathode ray oscilloscope (3 marks)
- c) With the aid of a block diagram, describe the operation of a cathode ray oscilloscope (11 marks)
- d) If one cycle of a waveform on an oscilloscope occupies **FIVE** division of the graticule and the time base speed set to  $10 \mu$  s/cm, determine the frequency of the waveform (2 marks)

### QUESTION FIVE – 20 MARKS

- a) Differentiate between powered and non-powered analogue multimeters (4 marks)
- b) With the aid of a diagram, explain the operation of an a.c. amplifier type electronic voltmeter (6 marks)
- c) (i) Illustrate the basic digital technique of frequency measurement (4 marks)
- (ii) Explain the disadvantages of the technique in c) (i) (2 marks)
- (iii) Describe how the problem in c)(ii) can be overcome (4 marks)