



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

UNIVERSITY EXAMINATION FOR:

CERTIFICATE IN ELECTRICAL POWER ENGINEERING (CEPE 3)

TESTING METHODS AND RELIABILITY (ELECTRONICS)

EEE 1201

END OF SEMESTER EXAMINATION

SERIES: MAY 2016

TIME: 2 HOURS

DATE: Pick Date Select Month Pick Year

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** Questions;. Attempt any **THREE** Questions.

Do not write on the question paper.

QUESTION ONE

- (i) One thousand similar equipment which are known to have constant failure rates of 5% per 1000 hrs, are put into operation at the same time; calculate the predicted times which will elapse before:
- (a) 50
 - (b) 500 equipment have failed. (6 marks)
- (ii) What is a signal converter? (1 mark)
- (iii) Explain with the aid of a diagram the measurement of resistance by the voltmeter ammeter method. Explain why the accuracy of the meter does not affect the result. (4 marks)
- (i) A 240 volt moving iron voltmeter takes a current of 0.25A when connected to a 250v dc supply. The coil has an inductance of 1 Henry. Determine the reading on the voltmeter when connected to a 250volt, 60Hz ac supply. (3 marks)
- (ii) Explain the following errors and the methods of minimizing them:
- a. Parallax error.
 - b. Gross error.
 - c. Systematic error. (6 marks)

QUESTION TWO

- (i) A telemetry transmission system of an earth satellite has an MTBF of 10000 hours. Estimate the probability of no failures during 1000 90-minute orbits. (4 marks)
- (ii) Explain the half split method of fault diagnosis. (4 marks)
- (iii) Give **three** examples of mechanical physical units. (3 marks)
- (iv) Describe the following standards:
- a. Primary standards.
 - b. Secondary standards.
 - c. Working standards.. (6 marks)
- (v) A spring controlled moving iron voltmeter reads correctly on 250 v dc. Calculate the scale reading when 250v ac is applied at 50Hz. The instrument coil has a resistance of 500Ω and inductance of 1 H and the series (non reactive) resistance is 2000Ω . (3 marks)

QUESTION THREE

- (i) Define the following terms.
- a. Measurement.
 - b. Derived units.
 - c. Fundamental units. (6 marks)
- (ii) State the **three** primary fundamental units commonly used in measurement. (3marks)
- (iii) A multimeter has a sensitivity of 500Ω per volt and reads 100 V full scale. If the Meter is to be used to measure the voltage across 10000Ω resistor, will it read correctly? (3 marks)
- (iv) Define the term **STANDARD** as used in measurement. (2 mark)
- Explain the following failures:
- i. Catastrophic.
 - ii. Degradation.
 - iii. Inherent weakness. (6 marks)

QUESTION FOUR

- (a) Draw and explain the bathtub diagram of a component of an engineering product. (6 marks)
- (b) Explain the following:
- i. MTBF.
 - ii. Maintainability.
 - iii. Availability.
 - iv. Reliability. (8 marks)
- (c) An electronic equipment has an MTBF of 10000 hours. Determine the probability of failure for this equipment in 5000 hours of life. (6 marks)

QUESTION FIVE

- (i) Define the following terms as used in measurement:
- a. Accuracy.
 - b. Span.
 - c. sensitivity
 - d. Error.
 - e. Precision. (5 marks)
- (ii) State and explain **THREE** main functions of instruments. (6 marks)
- (iii) a) What is a signal? (1 mark)
- b) Describe the **three** processes of signal conditioning. (6 marks)

c) Calculate the power gain of an amplifier which has an input of 10mW and output of 11 watts. (2 marks)