



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BTAC, Y2S1

ACH4202 : INTRODUCTION TO INSTRUMENTATION 1

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 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. Answer question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question one

- a) Briefly discuss the following terms: (6 marks)
 - (i) Experiment
 - (ii) Replication
 - (iii) Loading error
- b) Discuss briefly any three factors that one must consider when defining any analytical problem. (6 marks)
- c) Explain briefly the following methods used in enhancement of signal to noise ratio: (9 marks)
 - (i) Fourier transformations
 - (ii) Active filtering
 - (iii) Ensemble averaging
- d) Distinguish between a counter and a register and numerate their applications. (3 marks)

- e)
- (i) What is the relation between standard deviation and the precision of a procedure? (1 mark)
 - (ii) Find the standard deviation for the set of measurements below: (7, 18, 10, 15). (5 marks)

Question two

- a)
- (i) What is an operational amplifier? (3 marks)
 - (ii) State any four characteristic properties of an operational amplifier. (8 marks)
- b) Draw a diagram of:
- (i) A differential amplifier. (3 marks)
 - (ii) An operation amplifier. (6 marks)

Question three

- a)
- (i) Outline the two major sources of noises in instrumental analysis. (4 marks)
 - (ii) Discuss briefly the types of noise arising from an instrument. (6 marks)
- b)
- (i) Name the four basic categories of resources on operating system manages. (4 marks)
 - (ii) What are interface cards? (3 marks)
 - (iii) What does data collection involve? (3 marks)

Question four

- a)
- (i) What is the Q test used for? (2 marks)
 - (ii) Use the 90% confidence level to determine if the least value of the following data for % Fe in a sample should be omitted. 2.93%, 3.08%, 3.11%, 3.04%, 2.70%. (6 marks)
- b)
- (i) State the null hypothesis. (2 marks)
 - (ii) For the standard reference material containing 39% Hg, the values obtained are 38.9%, 37.4%, 37.1%. Calculate the values of t at 95% confidence and determine whether systematic errors were involved. (10 marks)

Question five

- a) Distinguish between:
 - (i) An automatic instrument and an automated instrument. (5 marks)
 - (ii) Discrete and continuous automated devices. (5 marks)
- b) Describe the principles of flow injection analysis. (10 marks)