



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (ELECTRICAL AND ELECTRONICS ENGINEERING)

EEE 414: INSTRUMENTATION

DATE: 16/5/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS

Answer Question ONE and any other TWO Questions.

QUESTION ONE (30 MARKS)

- a) Explain briefly the basic element of measuring instruments (3 marks)
- b) Distinguish between intelligent and dumb instruments (2 marks)
- c) Remote sensing techniques is one of the advance technology in data acquisition. What are the possible mean of transmitting its data to the respected servers for further analysis and broadcast Explain their merits and demerits for each media? (5 marks)
- d) Outline the characteristic of an instrumentation amplifier as one of the device used in amplifying low level signal hence explain how its achieved (4 marks)
- e) Data acquisition through sensor undergoes various stages of processing. Explain what happens at signal conditioning stage (3 marks)
- f) Briefly explain any four techniques devised for reducing measurement noise (4 marks)
- g) Explain the principle of temperature measurement using thermocouple device (4 marks)

- h) Why do we filter the signal? Explain the mechanism of signal lock, sampling; quantization; de-quantization; anti-aliasing effect.
(5 marks)
- i. Signal in the measuring instrument are categorized in what ways and how are they classified?
- ii. Briefly explain the any four types of filter used in signal analysis.

QUESTION TWO (20 MARKS)

- a) Discuss various factors that an Engineer could settle on before procuring an instrument for defined purpose (8 marks)
- b) Different application on data acquisition involves low level signal. Engineers have devised a simple way of amplifying such signals. Using illustration, explain how bridge network with sensing system and instrumentation amplifier becomes the candidature in such applications. (8 marks)
- c) Engineering field is quite diversified and production units in our industry it's scaled such that different sensing system are manufactured to aid their operations. To have optimal and steady function in data acquisition, explain briefly the devised criteria that's is been used in their selection. (4 marks)

QUESTION THREE (20 MARKS)

- a) Using illustration, explain principle of operation of successive approximation analog to digital converter. (8 marks)
- b) Calibration for any manufactured instrument is quite vital and it's good for such information to be reference with existing standard for the purpose of confirmative. Explain the nature of information that is retained in the calibration chain. (4 marks)

- c) Measuring instruments in most cases are not 100% efficiency. We always incur errors of different versions. Explain four devised mechanisms that Engineers have invented to countermeasure in reducing system error. (8 marks)

QUESTION FOUR (20 MARKS)

- a) Prevention is always better than cure, and much can be done to reduce the level of measurement noise. Describe the appropriate steps that have been devised in designing the measurement system to reduce the noise. (5 marks)
- b) Explain the principle involved in measuring low quantities for the following: (15 marks)
- Temperature
 - Pressure
 - Acceleration

QUESTION FIVE (20 MARKS)

- a) Interfacing from acquisition system is done into two ways asynchronous and synchronous. Distinguish between the two. (2 marks)
- b) Explain two types of ports used in interfacing. (2 marks)
- c) Describe the principle of serial interface DCE and DTE hence enlist the benefits of USB. (9 marks)
- d) Explain the logical operation of USB between HUB and HOST and the elements of data supervisory system used in automation. (7 marks)