

THE TECHNICAL UNIVERSITY OF KENYA

FACULTY OF APPLIED SCIENCES AND TECHNOLOGY

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

+END OF SEMESTER OCTOBER 2017 EXAMINATION SERIES

THIRD SEMESTER EXAMINATIONS 2016/2017

THIRD YEAR EXAMINATIONS FOR

BACHELOR OF COMPUTER TECHNOLOGY

**ECSI 3203: DIGITAL CONTROL ENGINEERING**

TIME: 2 Hours October 2017

Instructions to candidates:

This paper consists of FIVE Questions.

Answer Question ONE [30 Marks] and any other TWO Questions [20 Marks Each].

Write your university number on the answer sheet.

This paper consists of 3 printed pages

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

© October 2017 The Technical University of Kenya Examinations

**QUESTION ONE (30 MARKS) COMPUSOLY**

1. Briefly explain the meaning of the following terms as used in control systems engineering:
2. Digital Control system
3. Closed loop control system
4. Negative Feedback

**(6 Marks)**

b)Explain using a labeled block diagram of a control system what is meant by the canonicalform of a closed loop control system. **(3Marks)**

c) Derive the following quantities from canonical block diagram of a closed loop control system.

1. Closed loop transfer function
2. Actuating signal ratio

**(6 Marks)**

d) Describe the principle of operation of a digital computer controlled process system with the help of a labeled diagram. **(9Marks)**

e)Briefly explain the operation of a digital regulator system with the aid of a labeled block diagram. **(6 Marks)**

**QUESTION TWO (20MARKS)**

a)Explain howsampling is accomplished in a digital control system **(8 Marks)**

b) An 8 bit analog to digital converter(ADC)has a conversion time ,t of 0.5ms.Determine the maximum frequency **(12 Marks)**

**QUESTION THREE(20MARKS)**

1. Briefly explain the principle of operation of the following measurement transducers:
2. Thermocouples
3. Thermistors
4. Describe the operation of an instrumentation amplifier with the aid of a schematic block diagram.

**(20Marks**)

**QUESTION FOUR (20MARKS)**

a)Describe using a labeled block diagram the process of

i) Frequency measurement in digital control system

ii)Time interval measurement

**(10Marks**)

b)Describe using a labeled block diagram the operation of a 4-1 line multiplexer **(10Marks**)

**QUESTION FIVE (20MARKS)**

1. Describe the operation of a **ramp and counter** analogue to digital converter (ADC)

**(10 Marks**)

b)Describe the operation of a digital to analogue converter (DAC) and calculate the voltage output if input word is (1010)2 **(10Marks**