



## MURANG'A UNIVERSITY COLLEGE

*(A Constituent College of Jomo Kenyatta University of Agriculture and Technology)*

**DEPARTMENT: ELECTRICAL ENGINEERING**

**LEVEL: DIPLOMA**  
**CLASS: KNEC/EEP/15DJ3**  
**MODULE: I**  
**SEMESTER: III**  
**ACADEMIC YEAR: 2014/2015**  
**UNIT: MICROCONTROLLERS**  
**UNIT CODE: EE 1302**  
**DATE: 23 APRIL 2015**

**TIME: 3 HOURS**

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### *Instructions to candidates*

This paper contains SEVEN (7) questions

Attempt any FIVE questions

You should have the following for this examination;

- Drawing instruments
- Scientific calculator

### QUESTION 1

- a) Describe the following types of microcontroller processors
- Harvard architecture
  - Von-Neuman architecture

(8 Marks)

- b) With the help of block diagram describe the main components of a microcontrollers

(12 marks)

## QUESTION 2

- a) Draw ladder diagram programming symbols for each of the following
- (i). NO input contact
  - (ii). NC input contact
  - (iii). Output coil
- (6 marks)
- b) Explain the function of the following terms as used in microcontrollers.
- i. Address bus
  - ii. Data bus
  - iii. Control bus
  - iv. Monitoring devices
- (8 marks)
- c) Distinguish between SRAMs and DRAMs and Explain why microcontrollers use SRAMS and not DRAMs
- (6 marks)

## QUESTION 3

- a) Explain any THREE differences between microprocessors and microcontrollers
- (6 marks)
- b) Distinguish between external memory microcontrollers and embedded microcontrollers
- (4 marks)
- c) TWO advantages of microcontrollers over microprocessors in control operations.
- (4 marks)
- d) Explain following addressing modes giving an example for each
- (i). Immediate
  - (ii). Register
- (6 marks)

## QUESTION 4

- a) Explain any THREE ways in which microcontrollers are classified giving any TWO examples in each class
- (8 marks)
- b) Explain the following terms as used in process control
- (i). Process variable
  - (ii). Set point
  - (iii). Manipulated variable
  - (iv). Error
- (8 marks)
- c) Explain the term actuator as used in process control giving any TWO examples
- (4 marks)

## QUESTION 5

- a) Explain any THREE applications of microcontrollers (6 marks)
- b) Explain the following terms as used in process control
- i. Proportional band
  - ii. Dead Zone (4 marks)
- c) With the aid of a diagram, describe the operation of a proportional integral Derivative controller (10 marks)

## QUESTION 6

- a) With aid of a block diagram explain the operation of PLC (14 marks)
- b) Explain the function of each of the elements in a programmable logic controller
- (i). Timers
  - (ii). Counters (6 marks)

## QUESTION 7

- a) A digital control system has inputs A and B, and three outputs X, Y and Z. The relationship between the outputs and inputs is as follows:
- Output X indicates the absence of both inputs A and B;
  - Output Y indicates the presence of either input;
  - Output Z indicates the presence of both inputs.
- (i). Draw a truth table to represent these functions
  - (ii). Write the logic expressions for the functions (6 marks)
- b) Explain any THREE advantages of PLCs over conventional computers (6 marks)
- c) With the help of block diagram describe the functions the various parts in a feedback process control (8 marks)