



# TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF ENGINEERING AND TECHNOLOGY

ELECTRICAL AND ELECTRONICS DEPARTMENT

## UNIVERSITY EXAMINATION FOR:

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

DICE5

ECI 2303 PROCESS CONTROL SYSTEM 1

## END OF SEMESTER EXAMINATION

**SERIES:** MAY 2016 SERIES

**TIME:** 2HRS

**DATE:** MAY 2016

### Instructions to Candidates

You should have the following for this examination:

-Answer Booklet, examination pass and student ID: Mathematical Table

**Do not write on the question paper.**

QUESTION 1.

a) Define the following terms:-

- i. Process
- ii. Process Control
- iii. Control (6 marks)

b) State and explain 3 importance of process control? (6 marks)

c) With the aim of a well label diagram, explain the 4 element of a process control system? (8 marks)

QUESTION 2.

a) Explain the following term as used in process control?

- i. Process lag?
- ii. Process load?
- iii. Nominal value? (6 marks)

b) State and explain 3 reasons why manufacturies control the production process? (6 marks)

c) If the set-point in 2-10 MA range corresponds to 5.5 MA and the measured value is 7.5 MA

Calculate (8 marks)

- i. the error
- ii. the % error
- iii. state whether the error is below or above the set point.
- iv. If the deviation for variable is + -0.1 MA, find the variable range?

QUESTION 3.

a) State 4 factors that affect the choice of operating mode for any given process control system?

(4 marks)

b) A liquid-level control system linearly converts a displacement of 3 to 5 MA into a 5 to 20 MA control signal. A relay serves as the two-position controller open and close the inlet valve. The relay closes at 14 MA and opens at 12 MA.

Find

- i. The relation between displacement level and current.
  - ii. The neutral zone or displacement gap in meters. (8 marks)
- c) Briefly explain Two-Position (ON-OFF) controller mode? (6 marks)
- d) Give Two-applications of two-position control mode? (2 marks)

QUESTION 4.

a) Write short note on proportional control mode? (7 marks)

b) For a proportional controller, the controlled variable is a process temperature with a range of 30 to 110°C and a setpoint of 53.5°C. Under nominal conditions, the set point is maintained with an output of 50%. Find the proportional offset resulting from a load change that requires a 55% output if the proportional gain is

- i) 0.1            ii) 0.7            iii) 2.0            iv) 5.0?            (8 marks)

c) State 5 applications of proportional control mode? (5 marks)

QUESTION 5.

a) Briefly name the 3 most commonly used composite controller modes? (3 marks)

b) Briefly explain proportional-integral control mode? (8 marks)

c) State 2 applications of proportional-integral control mode? (3 marks)

d) State and explain 3 reasons why manufacturers control the production process? (6 marks)