



# TECHNICAL UNIVERSITY OF MOMBASA

---

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 while giving examples (6 marks)

- i. Manipulated variables
- ii. Control variables
- iii. set Point

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

c) Explain the 4 essential elements to a process control system with the help of a diagram(s)? (8 marks)

#### QUESTION 2.

a) With the aid of diagram explain the 2 types of good response? (6 marks)

b) Brief explain the meaning of the following terms?

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

c) A velocity control system has a range G120 to 380 mm/s. It the setpoint is 260 mm/s and the measured value is 240 mm/s.

Calculate

- i. the error
- ii. the % error
- iii. state whether the measurement is below or above the set point.
- iv. If the deviation for variable is 10 mm/s, then what will be the variable range? (8 marks)

QUESTION 3.

- a) Name three most commonly used composite controller mode? (3 marks)
- b) With the aid of well label diagram, Explain proportional-integral control mode? (8 marks)
- c) write short notes on Two-Position (ON-OFF) controller mode? (9 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 gains 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) 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 10 to 15 MA into a 15 to 30 MA control signal. A relay serves as the two-position controller open and close the inlet valve. the relay closes at 12 MA and opens at 10 MA.

Find

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