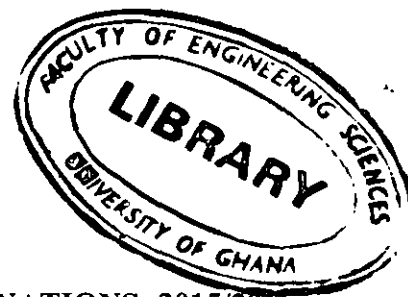




UNIVERSITY OF GHANA
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BSC ENGINEERING SECOND SEMESTER EXAMINATIONS: 2015/2016

**SCHOOL OF ENGINEERING SCIENCES
FPEN 404: FOOD PROCESS CONTROL (3 CREDITS)**

TIME ALLOWED: TWO (2) HOURS

Answer all Questions in Section A and ONE (1) from Section B

SECTION A

1. What is the importance of process control in food process industry? Illustrate your answer with examples from the food process industry.
2. Describe the following controls indicating how they are implemented, their advantages and limitations:
 - i. Feedback control
 - ii. Cascade control
 - iii. Selective control
 - iv. Fuzzy control
 - v. Ratio control
 - vi. Batch control
 - vii. Ratio control
3.
 - a. What is a transmitter in process control and give examples of transmitters.
 - b. Define (i) a transducer, (ii) a converter
 - c. Write short notes on the following: (i) pneumatic signals, (ii) analog signals and (iii) digital signals.
4. Give simple definition of the following as used in process control applications. Draw the block diagram of a feedback control system to illustrate where necessary.
 - i. Primary feedback signal
 - ii. Open-loop system
 - iii. Frequency response
 - iv. Measured variable
 - v. Control algorithm
 - vi. Closed-loop feedback control system
 - vii. Digital-to-analog (d/A) converter
 - viii. Load disturbance
 - ix. Programmable logic controller (PLC)
 - x. Feedback path

5. a. Describe the main components of a feedback process control system. Hint use a block diagram to illustrate.
b. What is the advantage in selecting a PID controller over a proportional controller.
c. What are the basic modes in process control theory, in each case give the fundamental design equation.

SECTION B

6. The process control system in the food processing factory where you are working may largely be characterised as a linear first order control system, if it is subjected to the following forcing functions what will be the output signals?
- step function;
 - ramp function;
 - parabolic function; and
 - sinusoidal function
7. The purpose of a controller is to operate either as a servo-type controller or a regulator-type controller.
- Define the following ratios for a servo-type operating as a simple feedback control system with no load changes in the process:
 - control ratio,
 - primary feedback ratio, and
 - error ratio
 - Determine the following ratios for the regulator-type control system when it subjected to only a variable load:
 - primary feedback ratio,
 - error ratio, and
 - control ratio.

In each case draw a block diagram of the control system and label its component parts.