



UNIVERSITY OF GHANA
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UNIVERSITY OF GHANA
FACULTY OF ENGINEERING SCIENCES

BSc. SECOND SEMESTER EXAMINATIONS: 2012/2013

FDEN 404: FOOD PROCESS CONTROL (3 Credits)

TIME ALLOWED: THREE (3) 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:
 - a. Feedforward plus feedback control
 - b. Batch control
 - c. Cascade control
 - d. Selective control
 - e. Fuzzy control
 - f. 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. Define a primary element in food process control theory give five (5) examples of such primary elements
 - d. 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) Closed-loop feedback control system
 - (iv) Digital-to-analog (d/A) converter
 - (v) Load disturbance
 - (vi) Programmable logic controller (PLC)
 - (vii) Frequency response

- (viii) Measured variable
- (ix) Control algorithm
- (x) Feedback path

SECTION B

5. 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?
- (a) step function;
 - (b) ramp function;
 - (c) parabolic function; and
 - (d) sinusoidal function
6. The purpose of a controller is to operate either as a servo-type controller or a regulator-type controller.
- (a) Define the following ratios for a servo-type operating as a simple feedback control system with no load changes in the process:
 - (i) control ratio,
 - (ii) primary feedback ratio, and
 - (iii) error ratio
 - (b) Determine the following ratios for the regulator-type control system when it subjected to only a variable load:
 - (i) primary feedback ratio,
 - (ii) error ratio, and
 - (iii) control ratio.

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

