



UNIVERSITY OF GHANA
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BSc. ENGINEERING
SECOND SEMESTER EXAMINATIONS: 2014/2015
FDEN 404: FOOD PROCESS CONTROL (3 Credits)

TIME ALLOWED: Two (2) Hours

INSTRUCTION:

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

SECTION A

1. (a) What is the importance of process control and instrumentation in food process industry? Illustrate your answer with examples from the food process industry.
2. 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) Frequency response
 - (ii) Measured variable
 - (iii) Control algorithm
 - (iv) Feedback path
 - (v) Primary feedback signal
 - (vi) Open-loop system
 - (vii) Closed-loop feedback control system
 - (viii) Digital-to-analog (d/A) converter
 - (ix) Load disturbance
 - (x) Programmable logic controller (PLC)
3. Describe the following controls indicating how they are implemented, their advantages and limitations:
 - a. Ratio control
 - b. Cascade control
 - c. Selective control
 - d. Fuzzy control
 - e. Feedforward plus feedback control
 - f. Batch control

SECTION B

4. The process control system in a fruit and vegetable processing factory may largely be characterised as a linear first order control system. If the process control system 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
5. (a) The purpose of a controller is to operate either as a servo-type controller or a regulator-type controller.
- (b) Determine the following ratios for a servo-type operating as a simple feedback control system with no load changes in the process:
- (i) primary feedback ratio,
 - (ii) error ratio, and
 - (iii) control ratio.
- (c) Determine the following ratios for the regulator-type control system when it is subjected to only a variable load:
- (iv) primary feedback ratio,
 - (v) error ratio, and
 - (vi) control ratio.

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