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2nd SEM. 2018/19

UNIVERSITY OF ESWATINI

FINAL EXAMINATION PAPER

PROGRAMME	:	BACHELOR OF SCIENCE IN FOOD SCIENCE, NUTRITION AND TECHNOLOGY YEAR IV
COURSE CODE	:	FSNT410/FNS410
TITLE OF PAPER	:	PROCESS CONTROL AND AUTOMATION
TIME ALLOWED	:	TWO (2) HOURS
INSTRUCTIONS	:	ANSWER QUESTION ONE (1) AND ANY OTHER TWO (2) QUESTIONS.

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QUESTION 1 (COMPULSORY)

(a) A snack was produced using extrusion cooking. The barrel temperature and the screw speed were controlled and kept at 180°C and 140 rpm, respectively to make sure the desired quality attributes are met. A control valve used to regulate the flow rate of steam that is used as a heat source and a variable speed motor was used to control speed by varying voltage.

i. With the help of a sketch (block diagram) describe how control is achieved by automatic feed-backward closed-loop control structure. **(8 Marks)**

ii. For the extrusion system, identify the following: **(6x2=12 Marks)**

1. The controlled variable(s)
2. manipulated variable(s)
3. the actuator(s)

(b) Describe how on/off type controller with differential gaps works using graphical illustration. **(10 Marks)**

(c) Make a distinction between regulation activities and servo activities. **(10 Marks)**

[TOTAL MARKS = 40]

QUESTION 2

(a) Describe the following: **(4x5 = 20 Marks)**

i. Damped response (show with the aid of graph)
ii. Self-generating
iii. Event-based controller
iv. Robustness

(b) Describe the comparative merits of feedback and feed forward control strategies. **(10 Marks)**

[TOTAL MARKS = 30]

QUESTION 3

(a) Describe the principle behind electronic noses and indicate its advantages and limitations **(10 Marks)**

(b) Describe the principle behind a capacitive transducer and give **three (3)** examples. **(10 Marks)**

(c) Explain how electromagnetic flow meter works **(10 Marks)**

[TOTAL MARKS = 30]

QUESTION 4

(a) Outline **five (5)** factors to be considered in the selection of transducers based on handling. **(10 Marks)**

(b) Describe vibration methods work in measuring level. **(10 Marks)**

(c) Explain how ultrasonic flow meters measure flow. **(10 Marks)**

[TOTAL MARKS = 30]