



**2<sup>ND</sup> SEM. 20119/20**

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**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.**

**DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY  
THE CHIEF INVIGILATOR**

**QUESTION 1 (COMPULSORY)**

- (a) Describe a sequential control with the help of illustration. (8 + 4 = 12 Marks)
- (b) Milk is pasteurized at 80°C with allowable temperature deviation of 4°C. Describe how on/off type controller with differential gaps works using graphical illustration for this pasteurization process. (12 Marks)
- (c) Describe the **four (4)** essential elements of process control. (16 Marks)

[TOTAL MARKS = 40]

**QUESTION 2**

- (a) Describe the following: (4x5 = 20 Marks)
- i. Settling time
  - ii. Final control element
  - iii. Filled thermal systems
  - iv. Automated flow lines
- (b) Describe four (4) reasons of automation. (10 Marks)

[TOTAL MARKS = 30]

**QUESTION 3**

- (a) Describe the importance of amplification and noise reduction methods when thermocouples are used. (12 Marks)
- (b) Describe the principle behind a bimetallic strip thermometer. (8 Marks)
- (c) Explain how time-of-flight method is used to measure level. (10 Marks)

[TOTAL MARKS = 30]

**QUESTION 4**

- (a) Outline factors to be considered in the selection of transducers based on cost effectiveness. (10 Marks)
- (b) Describe issues that must always be considered while using infra-red thermometers (10 Marks)
- (c) Explain how ultrasonic flow meters measure flow. (10 Marks)

[TOTAL MARKS = 30]