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UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMME	:	**BACHELOR OF SCIENCE IN HOME ECONOMICS [FOOD SCIENCE AND TECHNOLOGY OPTION] YEAR V**
COURSE CODE	:	**FST 511**
TITLE OF PAPER	:	**PROCESS CONTROL AND AUTOMATION**
TIME ALLOWED	:	**TWO (2) HOURS**
INSTRUCTIONS	:	**ANSWER QUESTION ONE (1) AND ANY OTHER (3) QUESTIONS**

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QUESTION 1 [COMPULSORY]

a) Discuss FIVE advantages and FIVE disadvantages of automatic process control

[10 marks]

b) Define the following terms:-

i. Analogue
ii. Digital
iii. Transducer
iv. Resolution
v. Sensitivity

[10 marks]

c) Explain feedback and forward control **[5 marks]**

[Total = 25 marks]

QUESTION 2

a) The wheat stone bridge circuit has been used in many measurement instruments, draw an unbalanced wheat stone bridge circuit used with a three wire resistance thermometer probe for temperature measurement

[10 marks]

b) Discuss the basic principle of operation of the following pressure measurement devices

i. Strain gauge
ii. Piezoelectric crystal transducer
iii. Elastic deformation element
iv. Mercury float manometer
v. Bourdon tube

[10 marks]

c) Discuss **TWO** devices for measuring flow that operates on differential pressure measurement across a restriction in a pipe line.

[5 marks]

[Total = 25 marks]

QUESTION 3

a) Discuss the application of the following switches in process automation
   i. Limit switch
   ii. Inductive proximity switch
   iii. Photo switch

[9 marks]

b) Discuss the principle of operation of devices for measuring the following parameters in food:-
   i. Density
   ii. pH
   iii. Viscosity

[12 marks]

c) Explain the principle of operation of the following controllers:-
   i. Pneumatic Controller
   ii. Hydraulic Controller

[4 marks]

[Total = 25 marks]

QUESTION 4

a) Explain the use of the following process control devices by giving an example in each case:-
   i. Temperature Controller
   ii. Liquid Level Controller
   iii. Pressure Controller

[15 marks]

b) Draw a cross section of a reference electrode used for measuring the pH of a food product

[10 marks]

[Total = 25 marks]

QUESTION 5

c) Explain the function of the following parts of a Programmable Logic Controller:-

i. Power supply unit (PSU)
ii. Central Processing Unit (CPU)
iii. Input Module
iv. Output Module
v. Communications Module

[15 marks]

d) Discuss the application of a Programmable Logic Controller (PLC) in an Aseptic Filling Machine.

[10 marks]

[Total = 25 marks]