

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**SECOND YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR
OF SCIENCE IN FOOD SCIENCE AND TECHNOLOGY**

FOST 233: FOOD PROCESSING INSTRUMENTATION AND CONTROL

STREAMS:

TIME: 2 HOURS

DAY/DATE: TUESDAY 30/03/2021

2.30 P.M – 4.30 P.M

INSTRUCTIONS

Answer all questions in section A and any other two in section B

Do not write anything on the question paper

All rough work to be done on the answer booklet and crossed through

SECTION A: ANSWER ALL QUESTIONS (30 MARKS)

Question one

Using a diagram, explain the elements of a food process control system.

Question two

Measurement error signals may result into food production losses and therefore knowledge of their causes is paramount to a food processor. Expound these errors. [10 marks]

Question three

Explain the working principles of a thermocouple and bimetallic strip in the measurement and control of temperature during food processing. [10 marks]

SECTION B: ANSWER ANY TWO QUESTIONS (40 MARKS)

Discuss the following pressure measurement devices. Use diagrams and highlight their principles of operations;

- (a) Manometer [5 marks]
- (b) Bourdon tube [5 marks]
- (c) Diaphragm-type pressure gauge [5 marks]
- (d) Bellows [5 marks]

Question five

- (a) Many food operations are timed in order to achieve quality and safety of the food. The choice of the timer depends on the operation as well as the cost. Explain the various types of timers of interest to a food processor. [10 marks]
- (b) With the aid of a sketch, illustrate how to set a 48 segment 25 hour/turn timer to stop a machine for 90 minutes per day at 4 equal interval and state the length of the intervals. [10 marks]

Question six

In a steam boiler, control of water level is a critical operation that ensures production of high quality steam and safety of the boiler. With this in mind:

- (a) Illustrate how steam is produced and show where instruments for control mechanism are located. [7 marks]
 - (b) Describe the water feed system control [3 marks]
 - (c) Describe the combustion system control [2 marks]
 - (d) Describe the pressure and temperature monitoring and control [2 marks]
 - (e) Illustrate and explain the working of steam pressure reducers. [4 marks]
 - (f) Explain how a safety valve works. [2 marks]
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