

# COLLEGE OF ENGINEERING & TECHNOLOGY



Department : Electrical & Control Engineering

Lecturer : Dr. Ahmed Kadry Abdelsalam

Course : Electrical measurements and instrumentation 2

Course Code : EE 312

Marks : 40

Date : 28/5/2015

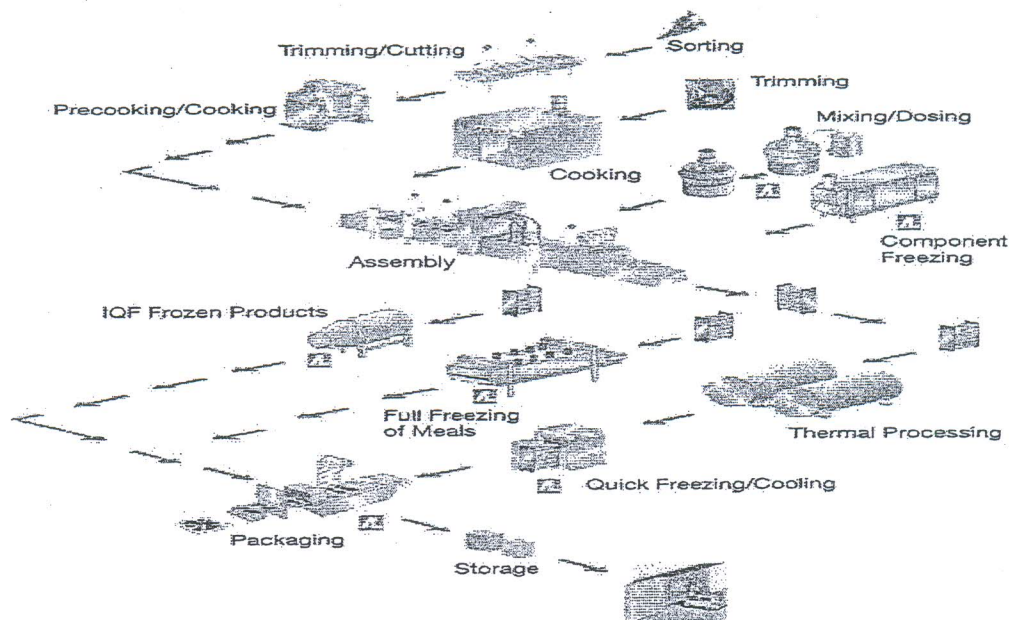
Time : 2 hour

## Final Exam

Answer all the following questions

**Q1- 15 marks**

For a temperature sensor in a food process, the required temperature measurement ranges from  $37^{\circ}\text{C}$  to  $300^{\circ}\text{C}$ . The output ranges from 4-20mA



Design a signal conditioning circuit for the measured temperature to give an output that ranges from  $-5\text{V}$  to  $5\text{V}$

Members of course Examination Committee:	Signature:	Date:
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Head of Department: Prof. Hamdy Ashour		17/5/2015

**Q2- 5 marks**

Discuss aided with drawings and equations the instrumentation amplifier theory of operation. Start from the basics and proof the final formula for this amplifier's input-output relation.

**Q3- 5 marks**

Discuss aided with drawings the Successive Approximation (A/D) converter theory of operation.

**Q4- 5 marks**

Draw an inverting op-amp circuit stating the input/output relation. If the required gain is 100, the output voltage is 10V, feedback resistance is  $5k\Omega$ , calculate:

- 1) The input voltage, 2) input resistance




**Q5- 5 marks**

Illustrate with diagram the two types of D/A converter principle of operation stating their advantages and disadvantages.

**Q6- 5 marks**

Compare between RTD and thermocouples from the following points of view:

- Construction (show with diagrams)
- Theory of operation (show with curves and equations)
- Cost
- Cold reference need
- Transducer need
- Range

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