EC 256: Transducers and Measurement Techniques

CREDITS = 6 (L=4, T=0, P=2)

1. Sensor, transducers and measurement: Basic concept of measurement and system of units, characteristics of measurement devices. Classification of transducers, characteristics of a transducer, accuracy, precision, error, linearity repeatability, sensitivity and resolution.


4. Optical Transducers: Nature of EM radiation, Characteristics of Light, Photo conductive detectors, Photo voltaic detectors, Photo diode, Photo Transistor and Photo emissive detectors.

5. Digital Transducers: Linear encoders, Rotary encoders – incremental and absolute, proximity detectors.

6. Signal Condition Circuits: Difference amplifier, Instrumentation amplifiers, Integrating amplifiers and differentiating amplifiers, voltage to frequency and frequency to voltage converter circuits.


REFERENCE BOOKS

Title: Measurement Systems : Application and Design
Author: Ernest O.Dobelin and D.N. Manik
Publisher: Tata McGraw-Hill Company

Title: Process Control Instrumentation Technology
Author: C.D. Johnson
Publisher: Prentice Hall of India

Title: Instrumentation: Devices and System
Author: C.S. Rangan, G.R. Sharma and V.S.V. Mani
Publisher: Tata McGraw-Hill Company
LIST OF PRACTICALS

1. **Introduction to Digital MultiMeters (DMM) for measurement**
   - Measurement of voltage, resistance and current using DMM.
   - Compare performance of various DMM like repeatability, linearity, accuracy
   - Testing various electronic component using DMM

2. **Introduction to Cathode Ray Oscilloscope (CRO) for measurement**
   - Study of Front panel control of CRO
   - Study of Internal circuit of CRO
   - Measurement of Frequency, Phase Difference and Voltage using CRO
   Note: This experiment may be completed in more than one session.

3. **Obtaining RTD Characteristics**
   - Study of data of an RTD
   - Obtain temperature v/s resistance graph
   - Convert resistance change in equivalent voltage
   Observe the effect of self heating.

4. **Obtaining Characteristics of Thermistor**
   - Study of data of a Thermistor
   - Obtain temperature v/s resistance graph
   - Convert resistance change in equivalent voltage
   Observe the effect of self heating.

5. **Obtain Characteristics of a Thermocouple**
   - Study the data of a thermocouple and its table
   - Obtain temperature v/s voltage characteristics

6. **Obtain Characteristics of Integrated circuit based Temperature Sensor**
   - Study data sheet of the ICs
   - Obtain temperature v/s voltage characteristics

7. **Obtain Characteristics of Potentiometers**
   - Study specification of potentiometer
   - Obtain displacement v/s voltage characteristics of potentiometer

8. **Obtain Characteristics of Synchros**
   - Study specification of Synchros
   - Obtain displacement v/s voltage characteristics of Synchros

9. **Obtain Characteristics of an LVDT**
   - Study specification of an LVDT
   - Obtain displacement v/s voltage characteristics of LVDT

10. **Obtain Characteristics of Strain Gauge**
    - Study specification of strain gauge
    - Obtain displacement v/s voltage characteristics of strain gauge

11. **Obtain Characteristics and study application of optical Transducers**
    - Study of LDR as an optical transducer
    - Study of Photo diode and Photo Transistor as optical transducer

12. **Study performance of digital transducers**
    - Study the specifications of encoders
    - Study incremental encoders and its output signal pattern and obtain position
    - Study absolute encoder and its output signal pattern and obtain position

13. **Performing experiment for signal amplification and conversion**
    - Integrating amplifier
    - Differentiating amplifier
    - Instrumentation amplifier
Performing an experiments to convert digital signal in to analog signal
- R-2R Ladder Network
- Binary Weighted Resistor Network

Performing an experiments to convert analog signal into digital signal
- Simultaneous ADC
- Counter Type ADC
- Integrating Type ADC