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DEPARTMENT : ELECTRICAL AND ELECTRONICS ENGINEERING LEVEL : 400 L  
COURSE CODE : EEE 471  
Course Title : Electronic Instrumentation(Digital) ASSIGNMENT

1. Explain briefly the signal processing and interfacing techniques in measuring instruments Answer

**A. Thevanin-Equivalent Model**

Voltage-output transducers measure a variety of effects, but their electrical interfaces can be roughly modeled by an ideal voltage source in series with an impedance (see Figure 1). Even though the impedance can result from capacitance or inductance (and vary with signal frequency), it can still be considered a simple resistance for many back-of-envelope calculations. Impedance limits the energy the signal source can deliver to a load. The same effect prevents you from starting your car's engine with 8 AA batteries in series

**B. Single-Ended vs. Differential Measurements**

A single voltage sensor output with respect to ground is called a single-ended output; transducers that provide two outputs, where the second either remains constant or changes with an opposite polarity to the first, produce differential or balanced outputs. Single-ended outputs have the advantage of simplicity, but they are more susceptible to interference and signal degradation than differential outputs. In cases where the sensor signal is small and rides on a significant DC bias, a balanced output lets you more easily discriminate changes, especially when the DC bias changes in response to environmental factors, such as temperature

**C. Ground and Isolation**

Ground is the point at which the voltage is taken to be zero. Unfortunately, voltage levels at one ground are not always the same as they are at another, and this is where the problems begin. Ground variations (measured at the wall outlet) of a few tens of millivolts AC (60 Hz) are not

uncommon in the same building. Such small variations don't often present major safety issues, but they can make remote voltage measurements difficult.

**D. Low-Voltage Signals**

Transducers often output microvolt signals, and you encounter difficulties when you try to accurately measure such small signals. The major difficulties are intrinsic noise from the sensor and the amplifier, thermal errors, and EMI.

2. Explain briefly the expert system instrumentation

An expert system is an example of a knowledge-based system. Expert systems were the first commercial systems to use a knowledge-based architecture. A knowledge-based system is essentially composed of two sub-systems: the knowledge base and the inference engine.