Course Title: Microprocessor Based Process Control
Course Code: EE413

Single supply signal conditioning

1. A pressure sensor outputs a voltage varying as 10mV/psi and has 2.5KΩ output impedance .Develop signal conditioning to provide 1 to 4.5 V as the pressure varies from 1 to 100 psi.

2. A sensor converts the liquid level in a tank to voltage according to the transfer function(-10mV/cm).The sensor read from 1 to 250 cm, it's required to be connected to a A/D converter so the output voltage must be in range from 1 to 6 V . Design a signal condition circuit using Single supply op-amp. (Vcc=Vref=10V).

3. A sensor output signal ranging from -0.1 V to -0.3 V must be interfaced into an analog-to-digital converter that has an input voltage range of 1 to 5 V. Design a signal condition circuit using Single supply op-amp.(Vcc=Vref=5V)

4. Design a single-supply signal conditioning circuit to fulfill the following requirements: Vout = 1 V at Vin = 0.1 V, Vout = 4 V at Vin = 0.2V, RL = 10 k, five percent resistor tolerances, and Vcc = 5 V. No reference voltage is available, thus Vcc is used for the reference input, thus Vref = 5 V.

5. A current Transducer (CT) is used to measure a current from 0 to 25 A the transfer function of the sensor is 0.1 V/A. Design a single supply signal conditioning circuit to make the output range from 1 to 5v.

6. Develop an signal conditioning circuit using single supply op-amp that can provide an output voltage which is related to the input voltage by: **Vo= -5.6Vin + 0.44**

7. Natural gas is stored in a tank. Its temperature is monitored using a temperature sensor with sensitivity 10 mV/C. The gas is stored at a temperature of 25C, and due to pressure changes the gas temperature may reach 100 C. The sensor range is 0~150 C & is to be connected to a A/D converter with the following characteristics:

· Four channel multiplexer.
· 10-bit resolution
· Conversion time=100 μ sec.
· Clock frequency of 20 KHz
· Sample & Hold 2 cycles
· Range of analog signal -5 to 5V.
· The available supply voltage is 10 V.

Determine:
1. The total analog to digital conversion time
2. The digital number range
3. The resolution
4. Design a signal conditioning circuit to adjust the sensor output voltage to be connected to the A/D converter.with full range voltage
5. If the analog input from sensor was 0.36V, calculate the corresponding digital number.