**Round 3**

**Lab Mannual**

**1.Aim**

Measuring Pressure Using Piezoelectric Pick up.

**2.Theory**

Differential pressure is the difference between two referenced pressures. So gauge pressure is a type of differential pressure where the referenced pressure is atmospheric pressure. Generally all pressure measurements are differential. The reference can be zero as absolute pressure, atmospheric pressure, or any other pressure.

Pressure transducers is generally classified into two types: gravitational and elastic types. In the gravitational type, the manometer is the simplest device. In elastic transducers, the pressure exerts a force on the area of an elastic device. The force exerted on elastic member is the diaphragm, capsule, bellows or a bourdon tube. The resultant displacement of the membrane is measured with an appropriate electric sensor. The most commonly used pressure sensing element is the diaphragm. They are rugged, reliable and have excellent stability.

The Motorola pressure sensor is designed by utilizing a monolithic silicon piezo resistor, which produced the voltage according to the applied pressure. Applying pressure to the diaphragm, change in resistance of strain gauge takes place, which causes a change in the output voltage proportional to the applied pressure. The strain gauge is an integral part of the silicon diaphragm.

Circuit diagram shown below is the steps of measurement of pressure using piezoelectric transducer. In this circuit firstly the known pressure is applied to piezoelectric transducer and output is shown in the digital multimeter through the differential amplifier. Then calibration of digital multimeter is done with the help of gain control knob of differential amplifier so that it can show the output numerically equal to the input pressure. Once the calibration is done then user can easily get the value of applied pressure.

**Circuit Diagram**

**3.Procedure**

It contains step by step procedure to run the simulator of virtual lab experiment

1. Click on the simulation button to open the simulator.
2. Switch ON the simulator Enable power button to work on the simulator.
3. Then from the place equipments area select the equipments according to the instruction to make connection in the working canvas area.
4. After placing the all equipment connect devices with wires.
5. Once the circuit connection is completed then Switch on the supply of the circuit from switch given in middle window of second column and apply the pressure input.
6. User will get output in the form of voltage in the multimeter reading window.
7. Now start calibrating the output multimeter reading with the help of gain control knob of the differential amplifier.
8. Once the multimeter is calibrated then output is shown numerically equal to the applied input pressure which is to be measured.

**Observation Table**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Input (in PSI)** | **output ( inVolts)** | | | | | | | | | |
| **S. No.** | **Applied Pressure (in PSI)** | **Output (in Volts) Gain 0dB** | **Output (in Volts) Gain 10dB** | **Output (in Volts) Gain 20dB** | **Output (in Volts) Gain 30dB** | **Output (in Volts) Gain 40dB** | **Output (in Volts) Gain 50dB** | **Output (in Volts) Gain 60dB** | **Output (in Volts) Gain 70dB** | **Output (in Volts) Gain 80dB** | **Output (in Volts) Gain 90dB** |
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**4.Pre Test**

Q1. What is differential pressure?

Q2. Which is the general reference pressure used?

Q3. Describe the working principle of differential pressure transducer?

Q4. Give some units of pressure?

Q5. What is piezoelectric effect and Piezoelectric transducer?

Q6.Membrane used in piezoelectric transducer made up of?

**5.Post Test**

Q1. Why the differential amplifier is used in the piezoelectric transducer circuit for pressure measurement?

Q2. What is the use of amplifier gain control knob in the simulator?

Q3. For what value of maximum pressure the simulator is designed?

Q4. What do you mean by calibrating any equipment/ instrument?

Q5. At what value of gain (in dB) the multimeter is calibrated?

**6.References**

1. <file:///C:/Users/pc/Downloads/III%20EIE%20I%20SEM%20TR%20LAB%20MANUAL%20(EE385).pdf>

2. <file:///C:/Users/pc/Downloads/Transducer-Manual-Print-engg-lab.pdf>

3. <file:///C:/Users/pc/Downloads/EMI_LAB_MANUAL.pdf>

4. <file:///C:/Users/pc/Downloads/IOP_Nano_BJNM2_MMPiezoSensing_v6_final.pdf>