**Department of Electrical Engineering**

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| **Faculty Member:\_\_\_\_\_\_\_\_\_\_\_\_\_** | **Dated: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| **Semester:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **Section: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

**EE-383**-**Instrumentation and Measurement**

**Experiment # 12**

**Magnetic Field /Infrared Distance/Piezo Vibration**

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| --- | --- | --- | --- | --- | --- | --- |
|  |  | **PLO4/**  **CLO3** | | **PLO4/ CLO4** | **PLO8/ CLO5** | **PLO9/ CLO6** |
| **Name** | **Reg. No** | **Viva / Quiz / Lab Performance** | **Analysis of data in Lab Report** | **Modern Tool Usage** | **Ethics and Safety** | **Individual and Teamwork** |
|  |  | **5 Marks** | **5 Marks** | **5 Marks** | **5 Marks** | **5 Marks** |
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**Open Ended Lab**

**QNET Mechatronics Sensors:**

**Magnetic Field /Infrared Distance/Piezo Vibration**

**Objective:**

Using the background information learnt about sensors in theory and labs, their properties, working principles and application; you are required to design and conduct experiment on QNET Mechatronics Sensors; Magnetic Field, Infrared and Piezo Vibration Sensors. Investigate their properties, analyze and verify results.

**Equipment:**

* QNET Mechatronics Sensor Board
* NI LabView (2014)

**Lab Tasks:**

**Task no. 1**

1. **Collect Data:** Using Magnetic Field Sensor and running VI in LabView, (Uncalibrated) Record Target Distance vs. Output Voltage Reading. Vary distance by rotating knob, and record your readings in table. Obtain the graph, Target Distance vs. Output Voltage. Take 6-7 Readings.

|  |  |
| --- | --- |
| **Target Distance(mm)** | **Sensor Output (V)** |
|  |  |
|  |  |
|  |  |

1. **Calibrate the Sensor**

Now calibrate your sensor, obtain calibration equation and test the accuracy of calibration. Record Actual Distance (mm) and Measured Distance (mm).

|  |  |
| --- | --- |
| **Actual Distance(mm)** | **Measured Distance(mm)** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

**Task no. 2**

1. **Collect Data:** Using Infrared Sensor and running VI in LabView, (Uncalibrated) Record Target Distance vs. Output Voltage Reading. Use a cardboard (30cmx30cm) of matte surface and vary distance, record your readings in table. Obtain the graph, Target Distance vs. Output Voltage.

|  |  |
| --- | --- |
| **Target Distance(cm)** | **Sensor Output (V)** |
| 10 |  |
| 15 |  |
| 20 |  |
| 25 |  |
| 30 |  |
| 35 |  |
| 40 |  |

1. **Calibrate Sensor:** Now calibrate your sensor, obtain calibration equation and test the accuracy of calibration. Record Actual Distance (cm) and Measured Distance (cm).

|  |  |
| --- | --- |
| **Actual Distance(cm)** | **Measured Distance(cm)** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

1. **Effect of Surface Reflectivity**: To observe the effect of surface reflectivity, repeat the data collection procedure using a target that has a highly shiny surface finish. Record your measurements in Table. Do you observe a notable difference?

|  |  |
| --- | --- |
| **Target Distance(cm)** | **Sensor Output (V)** |
| 10 |  |
| 15 |  |
| 20 |  |
| 25 |  |
| 30 |  |
| 35 |  |
| 40 |  |

**Task No. 3**

1. **Collect Data:** Using Piezo vibration sensor on the sensor board and running VI in LabView, with one finger manually perturb the plastic tab that is attached to the Piezo sensor and examine the response in the *Piezo Output* waveform chart. Hold the end of the plastic tab and slowly flex it. Examine the response.
2. Based on these two tests, what does the Piezo vibration sensor measure? How is the measurement different from a strain gage measurement? Capture sample results for both tests using the *Piezo* *Output* waveform chart.
3. **Determine the Natural Frequency:** Determine the natural frequency using natural frequency tab and record your observations.

|  |  |
| --- | --- |
| **Trial** | **Frequency(Hz)** |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |

**Lab Report:**

Your lab report should include the following sections:

**Objectives**

* This is the statement of problem(s) to be investigated and provide overall direction for laboratory investigation and *must* be addressed in the conclusion.

# **Equipment**

* + A list of all laboratory equipment used in the investigation
  + A *detailed* and *labeled* diagram to illustrate the setup of the experiment

# **Procedure**

* + Step-by-step procedure carefully explained in a numbered sequence
  + All experimental variables identified and named
  + Brief description of how the independent variables are controlled

# **Data**

* + What data needs to be taken? How many trials do you have to include?

# **Data Analysis**

* + How do you interpret data?
  + Include all graphs, analysis of graphs, laboratory calculations, and percent errors.

# **Conclusions**

* + Discuss any questionable data or surprising results.
  + Explain the possible source of any error or questionable results.
  + Suggest changes in experimental design that might test your explanations.