Measurement and Instrumentation Laboratory (EE3P005)

EXPERIMENT-6

Characteristics of Vibrations

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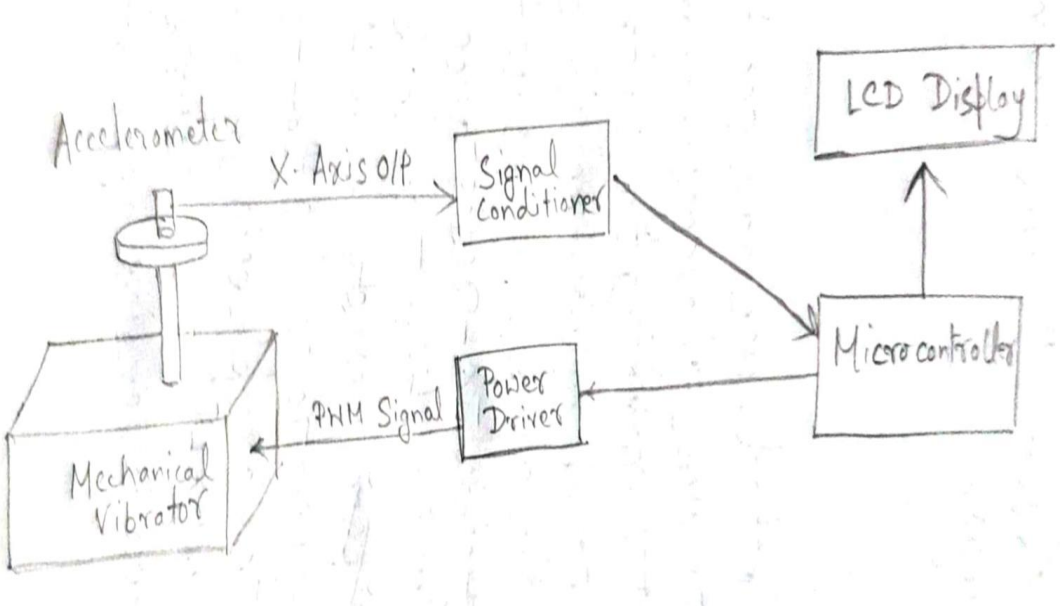
AIM OF THE EXPERIMENT:

To study the characteristics of vibrations

APPARATUS REQUIRED:

- Resistance Temperature Detector
- Digital Multimeter
- Beaker
- Water
- Submersible Water Heater

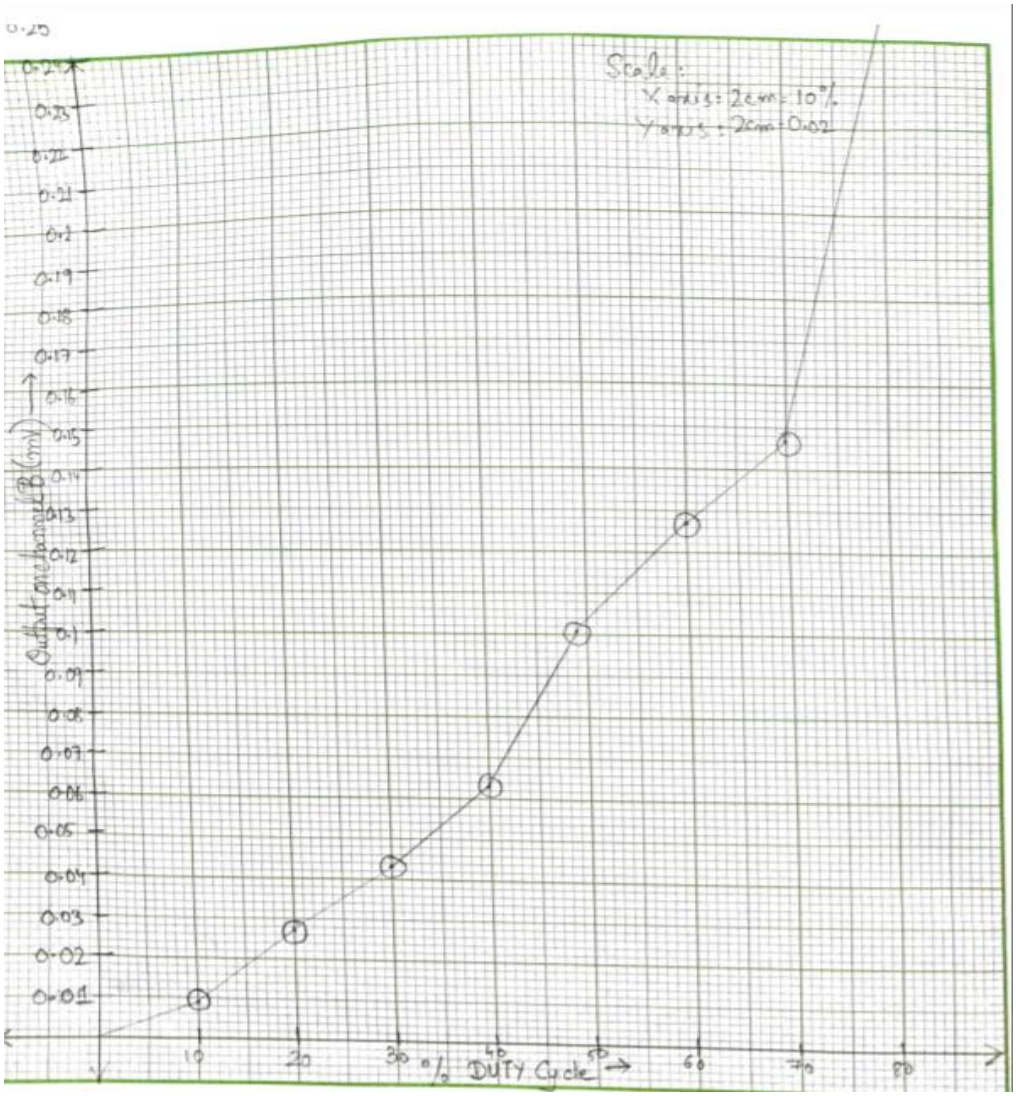
CIRCUIT DIAGRAM:

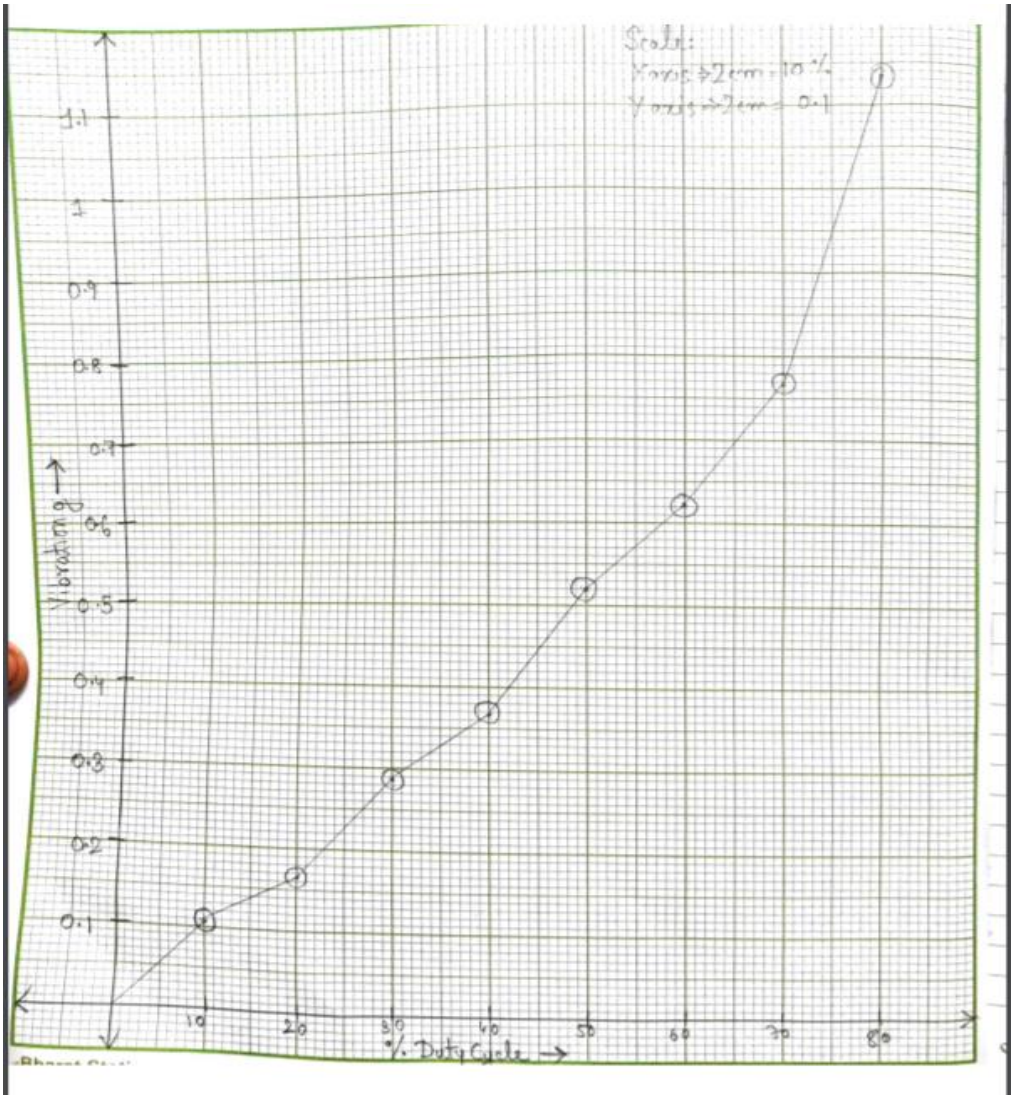


OBSERVATION:

% Duty cycle PWM seen On LCD	% Duty cycle PWM observed on CRO	Vibration g Observed on LCD	Output observed on Chan-b (mV)
10	10.2	0.106	0.003
20	21.1	0.165	0.027
30	30.5	0.284	0.043
40	40.6	0.366	0.063
49	50.0	0.52	0.105
70	70.7	0.768	0.147
81	81.6	1.136	0.25

GRAPH:





CONCLUSIONS

Thus in this experiment we have successfully learnt the working principle of accelerometer by measuring the vibrations and seeing their characteristics and tabulating the observed output voltage by varying the speed of the motor which is done by varying the duty cycle (ton/total time) and we have successfully plotted the graphs of gforce vs %pwm and Output amplitude vs %pwm

DISCUSSION

1) What is the objective of this experiment?

The objective of the experiment is to learn about the working principle of accelerometer i.e., to measure the vibrations produced by the motor using accelerometer and plot the %pwm vs g-force and %pwm vs output amplitude graphs.

2) Which instrument here measures the vibrations, be specific, and briefly summarize its operation?

Accelerometer is the instrument which measures the vibrations.
The Accelerometer consists of a capacitive sensing g-cell and a signal Conditioning in a single integrated Circuit.
The sensor is modeled as a movable beam that moves between two mechanically fixed beams. Here, two gaps are formed; one is between the movable beam and the first stationary beam and the second between the movable beam and the second stationary beam. The integrated circuit also condition the signal and filters the signal, providing a digital output that is proportional to acceleration. The integrated circuit uses switched capacitor techniques to measure the g-cell capacitors and extract the acceleration data from the difference between the two capacitors.

3) What is the use of the oscilloscope here?

The oscilloscope is used to observe the duty cycle in Channel-1 and the Output signal of Accelerometer in Channel-2.

PRIZE QUESTION

In the video the waveform on the oscilloscope frequently shakes and shimmers (visible at 10.14 min, 10.40 min etc. on the video). What is the reason and what can be done to stop that?

The oscilloscope frequently shakes and shimmers might be due to improper grounding in the probe or wrong voltage range or might be due to wrong trigger level or voltage division
It can be overcome by proper grounding of the probe and selecting correct trigger level and voltage division in the oscilloscope.