22.403 Mechanical Engineering Lab II

**Final Design Project, Weekly Progress Report, Fall 2012**

Project Title: Cantilever Beam Experiment \_, Date: 11/29/12

Group: 805D \_, Names: Joshua Bevan, Anthony Schifiliti and Matthew Spinazola

**Tasks performed in the previous week *(you may attach your calculations, drawings, equipment list, etc. to this sheet for submission)*:**

* Calibrated accelerometers with shaker 160Hz
* Attempted calibration of the eddy current probe using only micrometer tip
* It was determined that filtering of eddy current probe data should be done outside the lab
* Expected positions: 3.19in from the fixed end for eddy current probe (assuming nominal sensitivity of 200V/in), on the end of the beam will be the 100mV/g accelerometer, 4.5in from the fixed end for 1000mV/g accelerometer.

**Work plan for next week:**

* Test system using the attached procedure
* Calibrate the eddy current probe using the beam face and with the accelerometers
* Calibration could be done with shaker at a chosen frequency if time allows
* Process collected data for results
* Prepare final report and presentation

Figure Calibration of eddy current probe. Linear range not found.

**Experimental Procedure**Determine sensitivity for accelerometers:

1. To determine the sensitivity of the accelerometers they need to be placed on a surface of a known acceleration e.g. a shaker.
2. Record the voltages produced by the accelerometers at the known acceleration of the shaker.
3. Average the data obtained to determine the sensitivity.

Calibration of eddy current probe (static):

1. Before deflecting the beam (displacement of 0 on the micrometer) record the output.
2. Using the micrometer displace the beam in regular intervals recording the output at every interval.
3. Plot the output voltage against the displacement. The slope of the data (while linear) is the sensitivity of the eddy current probe. The linear range is expected to be 1/16 of an inch.

Applying force to tip:

1. Attach the three transducers to the 3 channels of the DAS.
2. Make sure the eddy current probe is near the beam at the specified location. Attach accelerometers to the beam their specified locations.
3. Extend the micrometer face until almost touching beam at rest.
4. Set the micrometer at the first desired displacement by retracting the micrometer face the desired displacement from the location at rest.
5. Displace the tip of the beam until touching the micrometer to get an exact displacement.
6. Release the beam and allow it to vibrate.
7. Record the output from the three transducers with labview, repeat runs as needed.
8. Compare experimental values with theoretical values.
9. View the results in the frequency domain. Determine if a filter is need for the eddy current probe, and if so what type and what settings.

Apply force to tip only measuring with the eddy current probe:

1. Remove accelerometers from the beam.
2. Repeat steps 3-8 above.
3. Compare results without the accelerometers to the previous results with the accelerometers. Calculate the natural frequency with the mass of the accelerometers added to the mass of the beam.

Measurements with accelerometers on the expected node positions:

1. Move accelerometers to the nodes of the first two modes.
2. Displace beam and record data as previously done.
3. Note if the expected node positions are the actual node positions (if not find them).

Calibration of the Eddy current Probe (dynamic):

1. Set the eddy current probe and the both accelerometers at the same location of the beam.
2. Pluck the beam.
3. Use data from both accelerometers with known sensitivities to determine the sensitivity of the probe.

Determination of Linear Range for eddy current probe:

1. Displace the eddy current probe using the micrometer.
2. Plot data in Microsoft Excel.
3. Continue collecting data until values no longer linear.