Instructions:

* Replace the highlighted areas in yellow above with your own name, section and group numbers and correct dates,
* Watch lab demo video and review related materials in lecture notes, lab manual and other related documents,
* Provide your best answers to the following questions. Add pages as needed,
* Convert this Word worksheet sheet into pdf format and submit to Canvas.

**1.** (4 points) In a sentence or two, state your definition of NDE.

**2.** (3 pts each) Under what technology category (e.g. visual examination, chemical testing, etc.) is each of the three NDE techniques learned in this lab?

**3**. (5 pts) How does tap testing determine the local stiffness of the part under testing? (3 pts) What is being measured?

**4**. (3 pts each) What are the three basic components in an ultrasonic immersion testing system?

**5.** (15 pts) For the ultrasonic immersion testing, you are instructed to follow a strategy of “sequential search”. Describe what this is and how it will be executed in the lab.

**6.** (10 pts each) Describe what are A-, B- and C-scans in an ultrasonic testing?

**7.** (10 pts) From what you learn in lecture notes, how does eddy current testing work?

**8.** (10 pts) Why is eddy current testing useful for sorting out metallic materials?

Total 95 points

Answers:

1. NDE, or Nondestructive Evaluation, are methods used by engineers to examinate and test an object or material without damaging or destroying it. In other words, NDE is used to evaluate the current condition of something without affecting its functionality.
2. The tap testing and ultrasonic testing are under the mechanical vibration category, while the Eddy current testing sits under the electromagnetic radiation category.
3. The CATT system determines the local stiffness of the part under testing from contact-time measurements between the tapping head and the part surface. With the known tapper head mass (M) and the contact-time duration measured by CATT (T), the part surface stiffness (K) can be determined by:
4. A transducer, a pulser/receiver, and an oscilloscope or a computer/screen for display.
5. The strategy of “sequential search” is basically finding a series of intermediate targets or signals, one leading to the next, and finally to the flaw signal of interest. We are looking for a small flaw located very close to the bottom surface of the metal disk. Using the strategy, we will first locate the UT signal leaving the transducer, then the echo of the front surface of the metal disk, followed by the echo of the back surface, and finally the flaw signal by searching spatially for it, until it appears right before the back surface echo.
6. A-scan (Amplitude-scan) is the echoes the are reflected when the incident UT pulse interacts with the sample front surface, defect, and back surface.

B-scan (Brightness-scan) is a side view of the sample being inspected. The intensity of the reflected signals is represented by a brighter spot in the graph, describing a defect. It helps us visualize the defect in the sample.

C-scan (Computerized-scan) is a top view of the sample being inspected. Similarly to the B-scan, a brighter spot in the graph represents the intensity of the reflected signals, which marks a defect. It also helps us visualize locate the defect in the sample.

1. Eddy current testing works by applying alternating electric current to coil roll to generate a changing magnetic field, which in turn generates EC in the conductive test sample. The presence of defect interrupts the flow of EC and hence its strength. By monitoring this strength change, EC can then be used to detect flaws.
2. Absolute probes are the Eddy current probes we are going to use this semester. They are sensitive to electrical conductivity and magnetic permeability of materials, which makes it very useful for sorting out different metals.