

MCE380 - Measurements and Instrumentation Lab  
Second Midterm Exam - Spring 2009  
Dr. Richter

**9 questions, duration: 90 minutes**

**Mark your answers in the answer sheet with pencil. Show your work for questions 2, 3, 7, 8 and 9 in separate sheets of paper with your name on them.**

**Open books and notes. No laptop computers, cell phones, PDAs, etc.**

**1.** To be able to use the deflection method in a Wheatstone bridge you need at least:

- a. Two ammeters and two formulas
- b. One voltmeter and one formula
- c. Two voltmeters and two formulas
- d. One resistance meter
- e. N.A.

**2.** A K-type thermocouple is generating 5mV when the reference junction is at 40°C. The temperature of the measuring junction in °C is closer to:

- a. -20
- b. 0
- c. 20
- d. 10
- e. -10

**3.** A J-type thermocouple is generating 15mV when the measuring junction is at 30°C. The temperature of the reference junction in °C is closer to:

- a. -20
- b. 0

- c. 20
- d. 10
- e. -10

**4.** A bimetallic strip is built by joining a copper plate and a nickel plate at 25° C. It is then installed as a cantilever beam with the nickel on top. The plates have the same length and width. When the temperature is 50° C:

- a. The center of curvature of the beam strip is above the strip
- b. The strip deflects upward
- c. The direction of the deflection depends on the thicknesses of the plates.
- d. More than one statement is true
- e. All statements, except this one, are false.

**5.** A piece of wire with a length of 1 meter and carrying a current of 1 A is exposed to a magnetic field. Which statement is true?

- a. The magnitude of the force appearing on the wire depends on the material of the wire
- b. The maximum possible force is 1 N, obtained when the wire is at right angles with the magnetic vector.
- c. The force depends on whether the wire is moving or not.
- d. More than one statement is true
- e. All statements, except this one, are false.

**6.** Which statement is true?

- a. A potentiometer can be used to convert mechanical energy to electric energy.

- b. A voltage divider produces different voltages according to the load resistance.
  - c. The principle of operation of an LVDT is a change of electrical resistance with position.
  - d. More than one statement is true
  - e. All statements, except this one, are false.
- c. 4
  - d. 1
  - e. The time constant is negative.

7. A tachometer features a torque constant of 0.01 N-m/A. The voltage generated by the tachometer at 1000 rpm is closest to:

- a. 10 V
- b. 0 V
- c. -10 V
- d. 3 V
- e. The voltage is not close to any of the above numbers.

8. A thermistor has a resistance of 10k $\Omega$  at 25 $^\circ$  and a resistance of 3.3k $\Omega$  at 50 $^\circ$ . The value of the coefficient  $\beta$  is closest to:

- a. 2000
- b. 0
- c. 3000
- d. 4000
- e. The coefficient is negative.

9. A thermometer is reading 42 F. The bulb is suddenly placed in boiling water. After 12 seconds, the reading is 202 F. The time constant of the thermometer is closest to:

- a. 2
- b. 3