ME318L F2006: Final Quiz

Part 1 (6 points)

Select the correct answer. More than one choice may apply.

1. To check the normality of a distribution, you will have to use...
   - ☐ the χ^2 distribution
   - ☐ the t-distribution
   - ☐ the Central Limit Theorem
   - ☐ the Poisson distribution

2. A gauge factor of 150 indicates that...
   - ☐ the gauge is made of metal foil
   - ☐ the gauge is made of constantan
   - ☐ the gauge is made of semiconductor material
   - ☐ the transverse sensitivity of the gauge is less than 0.01

3. A dead-weight tester...
   - ☐ is used by archeologists to measure the weight of Egyptian mummies
   - ☐ is very accurate
   - ☐ is highly portable
   - ☐ is used to calibrate other pressure-measuring devices

4. Surface temperature conduction error of a thermal probe...
   - ☐ is systematic
   - ☐ is random
   - ☐ will produce a lower reading (assuming the surface is hotter than the surroundings)
   - ☐ will produce a higher reading

5. If a thermocouple circuit does not include a standard reference junction...
   - ☐ a single "dummy" reference junction must be added
   - ☐ a pair of "dummy" reference junctions must be added
   - ☐ the table composed for standard reference still can be used
   - ☐ the circuit must be calibrated "from scratch"

6. Chemiluminescent detectors...
   - ☐ are used to measure ozone concentrations
   - ☐ are used to measure hydrocarbons
   - ☐ are used to measure the concentration of mercury in fish
   - ☐ do not distinguish between NO and NO_2

Part 2. Solve these problems (7 points each)

Four strain gauges ($S=2.1$, $R=120\Omega$) are attached to the top and bottom flanges of a symmetric I-beam, as sketched. Find the strain in the upper and lower flanges of the beam under a pure bending load if the bridge output is 40 mV.
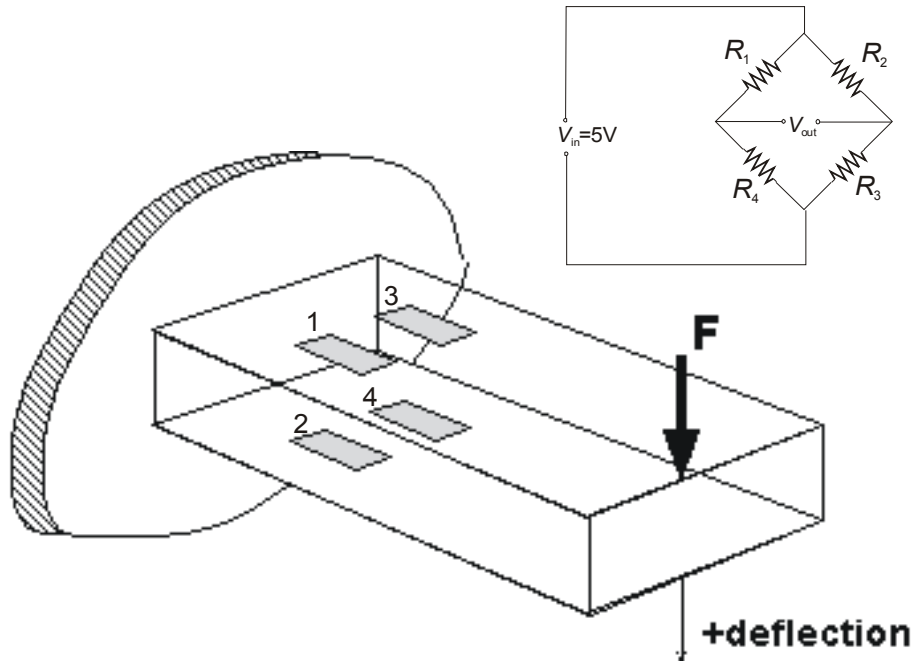
A critical flow nozzle measures the airflow rate into a variable pressure chamber. The upstream conditions are 8 atm, 20°C. Find the maximum pressure in the chamber for the nozzle to work accurately. What should be the nozzle diameter to sustain a flow of 100 SCMM?

Part 3. Will be credited 3 points ONLY if the perfect score for parts 1-2 is attained.

A machined entrance cone venturi tube is fit in a round air manifold (10 cm diameter). Find the air mass and volume (in SCMM) flow rates if the following is known: minimum diameter inside venturi 75 mm, associated pressure drop 6.9 kPa, upstream conditions 20°C and 690 kPa.