

Experimental Stress Analysis

Assignment # 2

Overview of Experimental Mechanics

1. Highlight the essential difference between the analytical, numerical and experimental methods. Mention in which classes of problems these methods are useful.
2. Do optical methods work as optical computers? Justify your answer with a suitable example.
3. Derive the strain field and the displacement field for the problem of a beam under pure bending and the cantilever beam with an edge load.
4. Summarise the physical principle (just two lines of info) exploited in the following techniques:
 - Strain gauges
 - Photoelasticity
 - Moiré
 - Brittle coatings
 - Holography
 - Speckle methods
 - Thermoelastic stress analysis
 - Digital image correlation
 - Caustics
 - Coherent Gradient Sensor

Also categorise the techniques based on increasing order of accuracy for measuring stress/strain/displacement fields – you may also use the information on sub-classification of these techniques in preparing the list.

5. Do you infer or expect anything from the very name of a particular technique? Support your answer with suitable examples.
6. What is the greatest advantage of an optical technique? Identify in which way this aspect can be used for solving day to day problems in engineering.
7. How have the recent technological developments influenced the experimental methods?
8. Can you do multi-scale analysis using the experimental approach?
9. If you are confronted with a practical measurement scenario how would go about choosing the appropriate technique?
