

B. E. / Part IV

8th Semester Final Examination, 2007

Subject Experimental Analysis of Stress & Strain (Elective - III)

Code No. AM-807 (Elective - III)
Branch CE & ME

Time : 3 hours

i) Use separate Answerscript for each half.

ii) The questions are of equal value.

Full Marks : 100

iii) Answer any THREE from each Half

iv) TWO marks for neatness in each Half.

FIRST HALF

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1. a) What is polarization? Explain briefly various types of polarization.
b) Classify polariscope.
c) Write down the 'Goodier' relations for "model to prototype" transformation for two-dimensional photoelasticity. (11+2+3)
2. a) In case of plane polariscope, deduce the expression for the intensity of light finally coming out of the analyzer.
b) For the above case, show how the effect of principal stress direction can be achieved. (12+4)
3. a) Explain Maxwell's Stress Optic Law.
b) Express Stress Optic Law in terms of relative retardation, principal stress and also principal strain.
c) Name two common photoelastic model material. (4+11+1)
4. Explain a suitable method of separation of the principal stresses in case of two-dimensional photoelasticity, writing down only the steps. (16)
5. a) Draw a labeled neat sketch of a circular polariscope, indicating the optical elements used.
b) What do you understand by Tardy's method of fringe compensation.
c) Write short notes (any TWO) :
 - i) Temporary Birefringence
 - ii) Wave Plate
 - iii) Iso-chromatic fringe pattern
 - iv) Calibration of photoelastic model material (any method)(5+3+8)

SECOND HALF

6. a) What are the common types of Strain Gauges used, depending on their principles of operation?
b) What are the required basic characteristics of Strain Gauges?
c) With neat labeled sketch explain briefly the principle of operation of the Huggenberger Tensometer. (4+2+10)
7. a) Explain briefly the optimum characteristics, which an electrical resistance Strain Gauge should exhibit.
b) What is Strain Sensitivity of the metallic alloy used as conductor for the electrical resistance Strain Gauge? Show that the Gauge Sensitivity depend on the dimension of the conductor and the Specific Resistance of the metallic alloy. (6+2+8)
8. a) Explain the terms:
i) Axial Strain Sensitivity
ii) Normal Strain Sensitivity
iii) Gauge Factor
b) Show that the Cross Sensitivity Factor of a flat grid electrical resistance Strain Gauge can be determined from the geometry of the gauge only. (4+12)
9. a) What is Strain Rosette? Under what circumstances Strain Rosettes are used.
b) For a three element Rectangular Strain Rosette mounted on a steel specimen, the following data have been recorded :
 $\epsilon_A = 285 \text{ micro cm / cm along } \theta_A = 0^\circ$
 $\epsilon_B = 65 \text{ micro cm / cm along } \theta_B = 45^\circ$
 $\epsilon_C = 102 \text{ micro cm / cm along } \theta_C = 90^\circ$
Find the Principal Strains, Principal Stresses and Principal angles. Take E for steel as 210 GPa and μ for the steel as 0.3. (4+12)
10. Write short notes on any TWO of the following providing neat sketches wherever required :
i) Alloys for Electrical Resistance Strain Gauge
ii) Weldable Strain Gauge
iii) Capacitance Gauge