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10ME/AE761

Seventh Semester B.E. Degree Examination, July/August 2021
Experimental Stress Analysis

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. Define 'gauge factor' and derive the equation to determine the same for an electrical resistance strain gauge. (10 Marks)
b. Explain Environmental Effects on performance of strain gauges. (10 Marks)
- 2 a. Explain the following with relevant sketches:
(i) Rectangular Rosette (ii) Delta rosette (iii) Two element rosette (06 Marks)
b. A delta strain rosette banded onto the surface of a structural member yields. The following strains in a strain indicator where the structural member is under load $\epsilon_A = 400 \mu\text{m/m}$, $\epsilon_B = -200 \mu\text{m/m}$ and $\epsilon_C = 200 \mu\text{m/m}$, given that the cross sensitivity is 0.06 and Poisson ratio of the material is 0.285. Determine the magnitude and direction of principal strains where the strain gauge rosette is banded. (14 Marks)
- 3 a. Discuss the effect of stressed model in a circular polariscope with dark field arrangement. (10 Marks)
b. What is calibration of photoelastic material? Explain the method of calibrating photoelastic model using a beam under pure bending. (10 Marks)
- 4 a. List the commonly used stress separation techniques. Explain the shear difference method in detail. (10 Marks)
b. The maximum shear stress at a point in a model of 5 mm thick is 9 MPa. The fringe order observed is 4.5, when observed with sodium light another model made of the same material and having a thickness of 7 mm is subjected to a plane state of stress. Observations of this model under mercury light reveals that the fringe order is 5. Find σ_1 and σ_2 if $\sigma_1 = 2 \sigma_2$. (10 Marks)
- 5 a. Explain stress freezing techniques for the determination of stress in 3-D photo elasticity. (10 Marks)
b. Sketch and explain scattered light polariscope. (10 Marks)
- 6 a. Explain with a neat sketch the principle of operation of a reflection polariscope. (10 Marks)
b. How the principal stresses of a coated specimen are separated by oblique incidence method? Explain in detail. (10 Marks)
- 7 a. What is brittle coating technique? State the assumption made in the brittle coating technique of stress analysis. (06 Marks)
b. What are the various types of brittle coatings available? Discuss their important features. (06 Marks)
c. Describe the calibration method generally used for brittle coating. How true threshold strains can be determined by this method. (08 Marks)
- 8 a. Explain with a neat sketch the displacement field approach to Moire-Fringe analysis. (10 Marks)
b. Discuss briefly the applications and advantages of the Moire's method of strain analysis. (10 Marks)

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