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10ME761/10AE761

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020

Experimental Stress Analysis

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART - A

- 1 a. What are the desirable characteristics of adhesive materials used to attach strain gauge to the test piece? (06 Marks)
- b. Explain the procedure for bonding the electrical resistance strain gauge on the surface of a machine component. (06 Marks)
- c. Define "gauge factor" and derive the expression for the same of an electrical resistance strain gauge. (08 Marks)
- 2 a. Explain different strain rosette configuration with relevant sketches. (10 Marks)
- b. A rectangular strain gauge rosette is bonded at a critical point onto the surface of a structural member when the structural member is loaded, the strain gauge shows the following reading: $t_0 = 850 \mu\text{m/m}$, $t_{45} = -50 \mu\text{m/m}$, $t_{90} = -850 \mu\text{m/m}$. The gauge factor and the cross sensitivity of the gauges are 2.80 and 0.06, find:
 - i) actual strains
 - ii) magnitude and directions of corrected principal strains. (10 Marks)
- 3 a. State and prove stress-optic law in terms relative retardation. (08 Marks)
- b. Derive an expression for the character of light transmitted emerging from the analyser of a plane polariscope and also discuss the formation of isoclinics and isochromatics. (12 Marks)
- 4 a. Explain the oblique incidence method that have been employed to determine the individual values of the principal stresses i.e. σ_1 and σ_2 . (10 Marks)
- b. Describe the desirable properties of an ideal photoelastic model material. (10 Marks)

PART - B

- 5 a. With a neat sketch explain the phenomenon of scattered light used as either a polarizer or an analyzer. (10 Marks)
- b. Explain how a scattered-light polariscope differs from the conventional type transmitted light polariscope. (10 Marks)
- 6 a. Explain in detail the theory of birefringent coatings. (10 Marks)
- b. Explain the working of a "reflection polariscope" employed to record the birefringe coating data. (10 Marks)
- 7 a. Explain the principle of Brittle coating technique in stress analysis and mention their advantages and disadvantages. (10 Marks)
- b. What is crack detection? Explain the two technique of crack detection. (10 Marks)
- 8 a. Briefly explain the formation of Moire fringe mechanism technique. (10 Marks)
- b. Explain the pure normal strain perpendicular to grid lines with respect to geometrical approach to Moire fringe analysis. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.