

# CRASH COURSE

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10ME761

Seventh Semester B.E. Degree Examination, May 2017

## Experimental Stress Analysis

Time: 3 hrs.

Max. Marks:100

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

### PART - A

- 1 a. What are the different types of adhesive used in strain gauges? Explain any two in brief. (06 Marks)  
b. Define gauge factor. Explain with a neat sketch a Piezo-resistive strain gauge. (06 Marks)  
c. Derive an expression for Potential difference across a constant current resistance bridge. (08 Marks)
- 2 a. What do you understand by a strain rosette? What are the different types of strain rosette configuration currently in use? Discuss their uses and limitations. (08 Marks)  
b. A delta rosette yields the following strain indications:  
 $\epsilon_a = -845 \mu\text{m/m}$ ,  $\epsilon_b = 1220 \mu\text{m/m}$  and  $\epsilon_c = 710 \mu\text{m/m}$ . Calculate maximum principal strain direction, the principal stresses and the maximum shear stress,  $E = 200\text{GPa}$ ,  $\nu = 0.285$ . (12 Marks)
- 3 a. With a neat sketch explain the elements of plane polariscope. (06 Marks)  
b. Discuss the important properties of isoclinic's and isochromatic fringe pattern. (06 Marks)  
c. Explain Calibration techniques used for photo elastic material. (08 Marks)
- 4 a. What are the important properties of an ideal photoelastic material? Discuss a few important photoelastic materials. (10 Marks)  
b. Explain the different types of scaling model prototype for stress analysis in 2-D photo elasticity. (10 Marks)

### PART - B

- 5 a. Define scattering. Explain the phenomenon associated with scattering property used as an polarizer and analyser. (10 Marks)  
b. Describe briefly the scattered light method to photoelastic stress analysis. Discuss the advantages and limitations, of this method. (10 Marks)
- 6 a. What are the assumptions to be made to analyze the coating behaviour? Explain the reinforcing effects of a coating thickness applied to photoelastic materials. (10 Marks)  
b. Explain the following stress separation techniques  
i) Oblique incidence method ii) Strip coatings. (10 Marks)
- 7 a. Discuss the crack patterns in brittle coating obtained under various combinations of stresses. Illustrate your answer by giving sketches. (10 Marks)  
b. Determine the stresses in a brittle coating applied to a component of steel for which  $E_s = 200\text{GPa}$ ,  $\nu_s = 0.30$ , when the specimen stresses are  $\sigma_1^s = 210\text{MPa}$  and  $\sigma_2^s = -140\text{MPa}$   
i) For a resin based coating with  $E_c = 1.40 \times 10^{-3}\text{MPa}$  and  $\nu_c = 0.42$  and  
ii) For a ceramic based coating with  $E_c = 70 \times 10^3\text{MPa}$  and  $\nu_c = 0.25$ .  
If the threshold strain is  $500 \mu\text{m/m}$ , what is the corresponding state of stress in the coating during calibration? (10 Marks)
- 8 a. Explain the following Moire's Fringes analysis techniques  
i) Geometrical approach ii) Displacement approach. (10 Marks)  
b. Discuss the fundamental properties of the Moiré's Fringes. What conditions must be fulfilled for successful application of the Moiré's method. (10 Marks)

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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.