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10ME761

Seventh Semester B.E. Degree Examination, June/July 2016
Experimental Stress Analysis

Time: 3 hrs.   Max. Marks: 100

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

PART – A

1   a.   Define gauge factor and derive the equation to determine the gauge factor for an electrical resistance strain gauge.   **(10 Marks)**
    b.   Derive the governing equation of potentiometer used for strain measurement.   **(10 Marks)**

2   a.   A two element rectangular rosette is used to determine the two principal stresses at a point if $E_1 = 860\mu m/m$ and $E_z = -390\mu m/m$ taking $E = 207$ GPa and Poisson's ratio as 0.3. Find σ_1 and σ_2.   **(05 Marks)**
    b.   A delta strain rosette bonded on to the surface of a structural member yields the following strain when the structure is loaded $E_0 = +500\mu m/m$, $E_{120} = -250 \mu m/m$ and $E_{240} = +250 \mu m/m$. Given $K_t = -0.07$ and $V_o = 0.285$. Determine the magnitude and directions of principal strains and stresses as the point when the strain rosette is bonded. Take $E = 80$GPa and Poisson's ratio as 0.3 for the structural member.   **(15 Marks)**

3   a.   Derive the stress optic law, as applied to two dimensional photoelasticity.   **(10 Marks)**
    b.   Explain the calibration technique used for photoelastic circular disc under diametrical compression.   **(10 Marks)**

4   a.   List the important properties of an ideal photoelastic material.   **(10 Marks)**
    b.   Determine the individual values of σ_1 and σ_2 using sheer difference method.   **(10 Marks)**

PART – B

5   a.   Explain with neat sketch, the concept of stress- freezing method.   **(10 Marks)**
    b.   With the help of neat diagram, explain the scattered light polariscope.   **(10 Marks)**

6   a.   Discuss briefly, Birefringence coating stresses and explain the isochromatic and isoclinic fringe patterns in a Birefringence coating.   **(15 Marks)**
    b.   Explain the effect of Poisson's ratio mismatch.   **(05 Marks)**

7   a.   List and explain types of Brittle coatings.   **(10 Marks)**
    b.   Discuss briefly the advantages and applications of Brittle coating.   **(10 Marks)**

8   a.   Explain Moiré's method for out of plane displacement measurement.   **(10 Marks)**
    b.   Discuss briefly the advantages and applications of Moiré method of strain Analysis.
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