10ME761

Seventh Semester B.E. Degree Examination, June/July 2015
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. Derive an expression for gauge factor for an electrical resistance strain gauge. **(10 Marks)**
   b. Explain with sketches the principle of working of the following strain gauge circuits.
      i) Potentiometer.   ii) Wheatstone bridge. **(10 Marks)**

2   a. What do you understand by a strain rosette? With the help of neat sketches give different types of strain rosette configuration. **(06 Marks)**
   b. A rectangular strain rosette mounted an the surface of a structural member indicates the reading when the member is stressed following.
      $\epsilon_{o} = 550\,\mu m/m$, $\epsilon_{45} = +50\,\mu m/m$, $\epsilon_{90} = -500\,\mu m/m$ modulus of elasticity of the material of the structural member $= 200 \times 10^{9}\,N/m^{2}$. Poisson's ratio of the material of the structural member = 0.30. Gauge factor and cross sensitivity of strain gauge are 2.80 and 0.06 respectively. Determine i) Actual strains along 0°, 45°, 90° directions. ii) Principal stresses and maximum shear strain.   iii) Principal stress and maximum shear stress. iv) Directions of principal stress. **(14 Marks)**

3   a. Sketch the dark field arrangement of circular polariscope and explain the effect of stress model. **(10 Marks)**
   b. Explain procedure for measurement of fractional fringe order by Tardy's method of compensation. **(10 Marks)**

4   a. Explain the shear difference method for he separation of principal stresses in 2-D photo elasticity. **(10 Marks)**
   b. List the properties of photo elastic model material and also give a list of material used. **(06 Marks)**
   c. Write a note on model of prototype scaling. **(04 Marks)**

PART – B

5   a. Explain the stress freezing technique for three dimensional photoelasticity. **(10 Marks)**
   b. Explain with a neat sketch the phenomenon of scattered light photoelasticity. **(10 Marks)**

6   a. Explain how stresses and strains can be measured using of birefringent coating. List various assumptions made. **(10 Marks)**
   b. How the principal stresses of a coated specimen are separed by obligue incidence method? Explain in detail. **(10 Marks)**

7   a. Explain with neat sketches brittle coating crack patterns produced by different states of stress. **(09 Marks)**

b. What is brittle coating technique? How it is useful for stress analysis? (05 Marks)

c. Explain calibration of brittle coatings. (06 Marks)

8 a. Explain the geometrical approach for moiré fringe analysis. (10 Marks)

b. Explain the method of out of plane displacement measurement using moiré. (06 Marks)

c. List the applications and advantages of moiré technique. (04 Marks)

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