

B.E. DEGREE EXAMINATIONS: APRIL/MAY 2011

Sixth Semester

AERONAUTICAL ENGINEERING

U07AR603: Experimental Stress Analysis

Time: Three Hours

Maximum Marks: 100

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

- Which of the following is a SI unit?
 (a) candela (b) weber (c) lumen (d) katal
- Which measurement is precise to 2.54 mm?
 (a) 2.5399 mm (b) 2.45 mm (c) 2.574 mm (d) 2.5 mm
- The Electrical Capacitance between parallel plate capacitor does not depend upon
 (a) Dielectric constant of the medium (b) Young's Modulus of the plates.
 (c) Area of the plates (d) Distance between the plates.
- The fundamental frequency of a stretched wire (f) can be expressed as
 (a) $\frac{1}{2L} \sqrt{\frac{E \delta L A}{L m}}$ (b) $\frac{1}{2L} \sqrt{\frac{E \delta L m}{L A}}$
 (c) $\frac{1}{4L} \sqrt{\frac{E \delta L A}{L m}}$ (d) $\frac{1}{2L} \sqrt{\frac{m \delta L A}{L E}}$
- Gauge Factor is the ratio of relative change in _____ to the mechanical strain
 (a) Electrical Resistance (b) Electrical Capacitance
 (c) Electrical Inductance (d) Electrical Impedance.
- The Assumption made during strain rosette analysis does not include
 (a) Isotropic (b) Non-Linear material (c) Homogenous (d) strain gradient is small.
- Corpuscular theory of light was proposed by
 (a) Albert Einstein (b) James Clerk Maxwell (c) Christiaan Huygens (d) Sir Isaac Newton
- Quarter wave plate are used to convert the plane polarized light into _____
 (a) Circular polarized light (b) Partially polarized light
 (c) Elliptically polarized light (d) Un polarized light
- The parameter not associated with Acoustic Emission Technique is
 (a) Event (b) Amplitude (c) Wavelength (d) Rise time
- Identify the radioactive source used in radiography testing
 (a) Te-129 (b) Cs-137 (c) U-238 (d) Cu-247

PART B (10 x 2 = 20 Marks)

11. Define Measurement.
12. List out any four Dynamic characteristics of measuring instruments.
13. Explain the principle of operation of acoustical extensometer.
14. List out any four types of Mechanical Strain Gauges.
15. What is meant by Temperature Compensation?
16. Explain the need for rosette analysis.
17. State Stress-Optic Law.
18. Show the arrangement of Optical Elements in a Circular Polariscopes.
19. Define Non-Destructive Testing.
20. Give the working principle of Acoustic Emission Testing.

PART C (5 x 14 = 70 Marks)

21. a) Explain the basic generalized measuring system with a neat sketch.

(OR)

- b) (i) Write short notes on

(a) Calibration (3)

(b) Sensitivity (3)

(ii) Explain the Sources of Errors. (8)

22. a) (i) What are the various types of Mechanical strain gauges? Explain Huggenberger tensometer and in detail. (10)

(ii) Write short notes on Acoustical Strain Gauge. (4)

(OR)

- b) What are the different types of electrical strain gauges? Describe LVDT and give its uses and limitations.

23. a) Explain Wheat Stone bridge network and

(i) Derive the expression for balanced bridge (6)

(ii) Explain the calibration of the bridge using shunt resistance. (8)

(OR)

- b) (i) Obtain the expression for the principal stresses and orientation of planes in terms of strains measured using Delta rosette. (7)

- (ii) The Strain values observed in Delta rosette are as follows, $\epsilon_1 = -400\mu$, $\epsilon_2 = -200\mu$, $\epsilon_3 = -200\mu$. Given $E = 200\text{Gpa}$, Poisson's ratio = 0.28. Compute the principal stress and maximum shear stress. (7)

24. a) Sketch a circular polariscope. Explain the effects of a stressed model loaded in a dark field setup.

(OR)

b) Explain any two compensation techniques used in photo elasticity.

25. a) Explain with neat diagrams

(i) Magnetic Particle Inspection. (8)

(ii) Holography. (6)

(OR)

b) Explain with neat diagrams

(i) Fluorescent Penetrant Technique. (8)

(ii) Fiber – Optic sensors. (6)
