Register Number……………………

B.E. DEGREE EXAMINATIONS: APRIL / MAY 2010

Sixth Semester

AERONAUTICAL ENGINEERING

U07AR603: Experimental Stress Analysis

Time: Three Hours   **Maximum Marks: 100**

Answer ALL the Questions:-

PART A (10 x 1 = 10 Marks)

1. One of the problem of repeatability of an instrument is mainly due to the existence of …………………
   - a. Backlashes in gear train
   - b. Friction at the pivot
   - c. Poor design
   - d. Age hardening

2. Gauge length is considered to be more important for …………….strains.
   - a. Linear
   - b. Curvilinear
   - c. Non-linear
   - d. Power series

3. Hugenberger extensometer exhibits gauge length of ……………….mm.
   - a. 15
   - b. 20
   - c. 25
   - d. 10

4. An Acoustical strain gauge essentially consists of ……….wire tensioned between two supports, a predetermined distance apart.
   - a. Ni-Chrome
   - b. Aluminum
   - c. Steel
   - d. Tin

5. Which one of the following is not a gauge material?
   - a. Elinvar
   - b. Kevlar
   - c. Invar
   - d. Chromel-C

6. The temperature range about which the organic plastics type bonding cements oxidize and softens rapidly is ……………….degree centigrade.
   - a. 100-400
   - b. 200-500
   - c. 300-700
   - d. 400-800

7. Which one of the following is not a separation method of principal stresses?
   - a. Shear difference method
   - b. Relaxation method
   - c. Analytic separation method
   - d. Stress difference method

8. Pick the odd one out based on photo-elastic materials.
   - a. Celluloid
   - b. Glass
   - c. Gelatine
   - d. Kevlar

9. Which one of the following is a quantitative NDT technique?
   - a. X-Ray Topography
   - b. Liquid Penetrant Technique
   - c. Magnetic Particle Inspection
   - d. Fibre optic sensors

10. Which one of the following is not a type of brittle coat?

    a. Resin based   b. Alcohol based

    c. Ceramic based   d. Tens-Lac based

PART B (10 x 2 =20 Marks)

11. State the difference between precision and accuracy.

12. Define the following in simple words.

        Cross Sensitivity

        Hydrostatic strain field

13. For a rectangular rosette arrangement of three-element type the principal strains are given by 350 and 35 micro strains. Calculate the principal stress values when E=70 GPa and poisson's ratio of 0.32.

14. What do you mean by photo-elasticity? What is its implication on experimental stress analysis techniques?

15. Write the classification of Mechanical Strain gauges.

16. What do you mean by stress locking in 3-dimensional photo-elasticity? What are the methods available to do so?

17. Write short notes on Acoustical Strain gauge.

18. Define and differentiate the following NDT methods.

        a.X-Ray Topography

        b.Laser Holography

19. What is Moire's Technique and state the field of applications.

20. What do you mean by (a). Deformation Sensitivity and (b) Strain Sensitivity.

PARTC (5 x 14 = 70 Marks)

21. a. (i) Compute the values of V and Rb in a potentiometer circuit from the following data. Assume the circuit efficiency to be 90%.   [8]

	R_g, ohms	120	350	1000
Gauge Factor F	F	2.0	2.0	3.5
	I_g, mA	30	60	100

(ii) Write explanatory notes on Acoustical Strain gauge.

      1. Pressure Transducers [3]

      2. Velocity and Acceleration Transducers [4]

(OR)

b. (i) Derive an expression for the sensitivity of a potentiometer circuit. [4]

  (ii) How a potentiometer can be calibrated? [3]

  (iii) A delta rosette yields the following strain indications: [7]

E = 200 GPa and Poisson's Ratio is 0.285	
Strain A	-845 micro strain
Strain B	1220 micro strain
Strain C	710 micro strain

Calculate the maximum principal strain direction, the principal stresses and the maximum shear stress.

22. a. (i) Discuss in detail about any two of the Mechanical Strain gauges. [7]

   (ii) Explain optical strain gauges which are based on the principle of either optical lever or mechanical lever. [7]

(OR)

b. (i) Explain in detail about the inductance or magnetic strain gauges. [7]

  (ii) Discuss about the capacitance strain gauges. [7]

23.a. (i) Given a fringe order of 5, a model thickness of 6.25 mm, a fringe value of 160 N/cm^2/cm per fringe and an isoclinic parameter of 25' defining the angle between one of the principal stress and the x axis, determine the shear stress about XY plane. [7]

  (ii) Discuss the effects of stressed model in a circular polariscope with bright field arrangement. [7]

(OR)

b. (i) What do you mean by

        1. Temporary Double Refraction [2]

        2. Define Birefringence and Isopachics. [2+1]

(ii) Discuss the important properties of isoclinics. How isoclinics of various parameters can be obtained? [4+3]

(iii) State the stress optic law in two dimension and obtain an expression for the same. [2]

24. a. (i) Discuss the effect of stressed model in a plane polariscope with dark field arrangement. [7]

    (ii) Explain any one if the compensation techniques used in photo elasticity. [7]

(OR)

b. Write short notes on

        1. Direct measurement [3]

        2. Inferential Measurement [4]

        3. Primary Standard [3]

        4. Secondary and working standards [4]

25. a. (i) Write short notes on

        1. Magnetic particle Inspection [4]

        2. Fluorescent Penetrant technique [4]

   (ii) Explain in detail about Moire's Technique [8]

(OR)

b. (i) Explain the method and importance of Fiber-optic sensors in NDT. [8]

   (ii) Explain in detail about the Acoustic Emission Technique. [8]

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