

B.TECH.
THEORY EXAMINATION (SEM-VIII) 2016-17
EXPERIMENTAL STRESS ANALYSIS
Time : 3 Hours
Max. Marks : 100
Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.
SECTION – A
1. Explain the following:
10 x 2 = 20

- (a) What do you mean by Principal plane and Principal stresses?
- (b) What is null balancing wheat stone bridge circuit?
- (c) Define stress optic law.
- (d) State the method of calibrating of strain gage.
- (e) What are the requirements in selection of Photo elastic materials?
- (f) How will you obtain dark and light field in a circular polariscope?
- (g) Enumerate the various Non-Destructive Testing (NDT) methods?
- (h) What is a stress gauge?
- (i) In what way three dimensional photo elasticity is different from two-dimensional photo elasticity?
- (j) Briefly explain Isochromatic Fringe Pattern.

SECTION – B
2. Attempt any five parts of the following questions:
5 x 10 = 50

- (a) Derive an expression for change in output voltage of wheat stone bridge circuit in terms of the changes in resistances.
- (b) Explain in detail the working principle and measurement of strains from an Acoustical strain gauge with neat sketch.
- (c) What is energy absorbed by a system, complementary strain energy and elastic strain energy? Explain these with the help of diagram.
- (d) What is significance of strain compatibility equation? Write down these compatibility equations.
- (e) Derive an expression for output voltage of whetstone bridge circuit for strain gauges. Calculate the sensitivity when all the gauges are active. Given $R_g = 120$ ohms, $I_g = 50$ mA, $S_g = 2$.
- (f) What are strain rosettes? What are their uses? For a rectangular rosette on a steel specimen ? $\epsilon_A = -600 \times 10^{-6}$, $\epsilon_B = 300 \times 10^{-6}$, $\epsilon_C = 400 \times 10^{-6}$. Determine the principal strains, principal stresses and directions $E_{steel} = 210$ Gpa.
- (g) Derive expressions for: (i) minimum and maximum stresses and strains, (ii) angle of principal stress, (iii) shear stress in each case

SECTION – C
Attempt any two parts of the following questions:
2 x 15 = 30

- 3 (i) Why do we require separation? Explain any two-separation techniques in detail.
- (ii) Explain in detail how stress-freezing technique is employed in three-dimensional Photoelasticity?
- 4 Explain the following:
 - (i) Ultrasonic testing in NDT and their applications.
 - (ii) Radiography
- 5 (i) Explain with necessary equations how isoclinics are eliminated in circular polariscope setup. What are the properties of isochromatics?
- (ii) Explain any two compensation techniques used in Photoelasticity.