

**M.E. DEGREE EXAMINATIONS: NOVEMBER 2009**

Third Semester

**STRUCTURAL ENGINEERING**

P07SEE02 Experimental Methods and Model Analysis

**Time: Three Hours**

**Maximum Marks: 100**

**Answer ALL Questions:-**

**PART A (10 x 2 = 20 Marks)**

1. What is the principle under which an acoustical strain gauge works?
2. Why foil type strain gauges are preferred over wire type gauges?
3. Explain transducer
4. List the effects of lead wires on strain measurement
5. What are Moire fringes?
6. Explain strain rosettes
7. Define stress-optic law
8. What are isochromatics?
9. What do you understand by geometric similarity?
10. State Buckingham Pi theorem

**PART B (5 x 16 = 80 Marks)**

11(a)(i) With a neat sketch, explain the principle, construction and working of a Huggenberger Mechanical strain gauge. (10)

(ii) How will you measure the displacement of a point in a loaded beam? Explain. (6)

**(OR)**

(b)(i) Describe the working of an acoustical strain gauge with a neat sketch. (10)

(ii) Explain Force Transducer. (6)

12(a) (i) Explain how the Potentiometer Circuit is used in strain measurement. (10)

(ii) What is a load cell? How it works? (6)

**(OR)**

(b)(i) Describe the Wheatstone bridge circuit and indicate how strain is measured using this circuit. (10)

(ii) How a pressure transducer works? Explain. (6)

- 13(a)(i) Explain with a neat sketch, the working of a Digital strain indicator (10)  
(ii) How Moire fringes are formed? (6)

**(OR)**

- (b)(i) How will you measure dynamic strain? (4)  
(ii) The strain measurement at a point with an equiangular rosette gave the following readings:

$$\epsilon_{0^\circ} = 400 \text{ micro strain (Compression)}$$

$$\epsilon_{60^\circ} = 250 \text{ micro strain (Compression)}$$

$$\epsilon_{120^\circ} = 650 \text{ micro strain (Tension)}$$

Find the principal stresses and Principal planes at that point. What is the maximum shear stress at that point?  $E = 200 \text{ kN / Sqmm}$ ;

$$\text{Poisson's ratio} = 0.35 \quad (12)$$

- 14 (a) (i) Discuss the effect of a stressed photoelastic model in Plane Polariscopes. (10)  
(ii) Distinguish between isoclinics and isochromatics. (6)

**(OR)**

- (b)(i) Explain the shear difference method of separation of principal stresses in Photoelasticity. (10)  
(ii) How do you conduct nondestructive testing on concrete cubes using Ultrasonic pulse velocity technique? (6)

- 15(a)(i) Explain the various similitude requirements that a model must satisfy. (10)  
(ii) Distinguish between direct and indirect models. (6)

**(OR)**

- (b) (i) What are the requirements of a model material for direct model analysis? (6)  
(ii) The Ground floor roof of an existing two storeyed RCC building is to be tested to check whether it can carry the expected load. Discuss briefly the testing procedure indicating the acceptance of the test. (10)

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