

**B.Tech. – VIEP – MECHANICAL ENGINEERING
(BTMEVI)**

00443

**Term-End Examination
December, 2016**

BIMEE-005 : EXPERIMENTAL STRESS ANALYSIS

Time : 3 hours

Maximum Marks : 70

Note : Attempt any seven questions. All questions carry equal marks. Assume missing data suitably. Use of scientific calculator is permitted.

1. In a strain gauge Wheatstone bridge shown in the Figure 1 given below, the four limbs were :

$$R_1 = 99.75 \, \Omega \text{ (strain gauge resistance)}$$

$$R_2 = \text{Variable}$$

$$R_3 = 100 \, \Omega$$

$$R_4 = 10000 \, \Omega$$

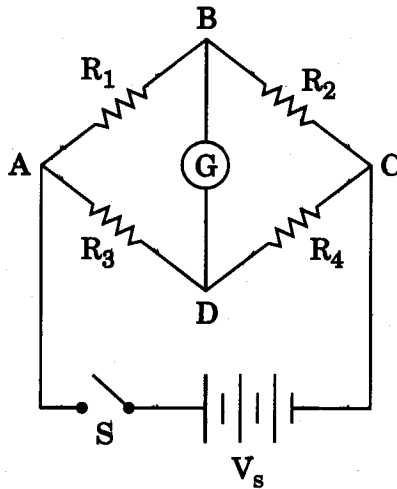


Figure 1

What is the value of variable resistance R_2 at initial balance with zero strain ? When the bridge was balanced after the strain was applied, this resistance increased to 9997Ω . Make calculations for the change in resistance of the gauge and the strain applied, if the gauge factor is 2.0.

10

2. What do you understand by a strain rosette ? What are the different types of strain rosette configurations currently in use ? Discuss their uses and limitations.

10

3. Explain, in detail, the compensation techniques used in photoelasticity.

10

4. What are the various types of mechanical strain gauges ? Explain with neat sketch, the working of Huggenberger tensometer in detail.

10

5. What is optical strain gauge ? Explain any one optical strain gauge with the help of a neat diagram.

10

6. (a) Describe the features of 'Isochromatic' and 'Isoclinic' fringe patterns.

5

(b) Describe the 'shear difference' technique to separate the principal stress in case of stress analysis using photoelasticity method.

5

7. (a) Write the equations of generalized Hooke's law.
- (b) Describe the working of wave plates in brief.
- (c) Describe the Grid method of strain analysis in brief.
- (d) Illustrate the Mohr's circle for general state of stress. $4 \times 2 \frac{1}{2} = 10$

8. What are the different types of electrical strain gauges ? Describe a capacitance strain gauge with a neat sketch. Give its uses and limitations. 10

9. At a point inside a body, the displacement field is linear and is given as :

$$\begin{bmatrix} u \\ v \\ w \end{bmatrix} = \begin{bmatrix} 0.10 & 0.05 & 0.04 \\ 0.03 & -0.02 & 0.03 \\ -0.04 & 0.04 & -0.02 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

Calculate the various components of strain. 10

10. Write short notes on any *two* of the following : $2 \times 5 = 10$

- (a) Circular Polariscopes
- (b) Oblique Incidence Methods
- (c) Tardy's Compensation Method