| BIMEE-005 |

B.Tech. MECHANICAL ENGINEERING (BTMEVI)

00954

Term-End Examination

June, 2014

BIMEE-005 : EXPERIMENTAL STRESS ANALYSIS

Time : 3 hours   *Maximum Marks : 70*

Note :   *Attempt any seven questions. All question carry equal marks.*

1. Stresses acting at a point P in a body are given as   **10**
    $\sigma_x = 30$ kN/cm^2, $\sigma_y = -10$ kN/cm^2,
    $\sigma_z = 10$ kN/cm^2 and $\tau_{xy} = \tau_{yz} = \tau_{zx} = 10$ kN/cm^2.
    Determine the normal and shearing stress on a
    plane that is equally inclined to all the three axes.

2. At a point inside a body, the displacement field is   **10**
    linear and is given as below. Calculate various
    components of strain.

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

3. What are various types of Mechanical strain   **10**
    gauges ? Explain, with neat sketch, working of
    Huggen berger tensometer in detail.

4. What are the various types of optical strain   **10**
    gauges ? Explain with neat sketch Tuckerman
    gauge in detail.

5. Why wheatstone bridge circuits are preferred over potentiometer circuits in static strain measurements ? Explain. Also differentiate between bonded and unbonded gauges. **10**

6. A fringe order of 2.5 was observed at a point in a stressed plane stress model with light having a wavelength of 589 nm. Assuming that 'C' remains constant ; what fringe order would be observed at the point considered when light with $\lambda = 548$ nm is used ? **10**

7. What do you understand by a strain rosette ? What are the different types of strain rosette configurations currently on use ? Discuss their uses and limitations. **10**

8. Sketch a circular polariscope. Explain the effects of a stressed model and the fringes obtained in it. **10**

9. The state of stress at a point for a given reference *xyz* is given by the following array of form **10**

$$\begin{bmatrix} 15 & 8 & -6 \\ 8 & -12 & 5 \\ -6 & 5 & 8 \end{bmatrix} \text{MPa}$$

Determine the principle stresses.

10. Explain, in detail, compensation techniques used in photo elasticity. **10**