No. of Printed Pages : 3

BIMEE-005

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

Term-End Examination

00325 **December, 2014**

BIMEE-005 : EXPERIMENTAL STRESS ANALYSIS

Time : 3 hours *Maximum Marks : 70*

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

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

$$\begin{bmatrix} u \\ v \\ w \end{bmatrix} = \begin{bmatrix} 0{\cdot}10 & 0{\cdot}05 & 0{\cdot}04 \\ 0{\cdot}03 & -0{\cdot}02 & 0{\cdot}03 \\ -0{\cdot}04 & 0{\cdot}04 & -0{\cdot}02 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

2. At a point in a stressed material, the cartesian stress components are

$\sigma_x = -40$ MPa, $\sigma_y = 80$ MPa, $\sigma_z = +120$ MPa,

$\psi_{xy} = 72$ MPa, $\psi_{yz} = 46$ MPa, $\psi_{zx} = 32$ MPa

Calculate the normal, shear and resultant stresses on a plane whose normal makes an angle of 48° with the x-axis and 61° with the y-axis. *10*

3. What are the basic characteristics of a strain gauge ? Explain the construction and working of an Acoustical strain gauge. *10*

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

5. Write short notes on the following : *10*

   (i) Electromagnetic strain gauge

   (ii) Weldable strain gauge

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

7. The maximum shear stress at a point in a model of 0·5 cm thickness is 9,000 kN/m^2. The fringe order is 4·5 when observed with sodium light. Another model made of the same material and having a thickness 0·7 cm is subjected to a plane state of stress. Observation of this model under mercury light reveals a fringe order of 5·0.

   Evaluate the individual principal stresses at the point if one of the stresses, say σ_1 is twice the value of the other principal stress σ_2 i.e. $\sigma_1 = 2\sigma_2$. *10*

8. Explain the Tardy's compensation method in detail. Why is this method preferred over other methods ? *10*

9. What do you mean by strain gauge ? List the various types of strain gauges. What are the various factors to be considered before selecting a gauge ? *10*

10. Explain the brittle coating method in detail. What are the advantages and limitations of this method ? *10*