(3 Hours)   [Total Marks : 80]

Note: Attempt **any 4** questions
Figures to the right indicate full marks
Assume data wherever required and mention it clearly

1   (i)   Write short note on the following

(i)   Mounting of strain gauges (ii) Fatigue life   10

(ii)   Show that shear strain ε_{yz} is given by $\varepsilon_{yz} = \dfrac{\partial v}{\partial z} + \dfrac{\partial w}{\partial y}$ 10

2   (i)   State and derive stress optic law in 2-D   10

(ii)   Given the strains at a point as

$$\varepsilon_{xx} = 3, \tau_{xy} = 3$$
$$\varepsilon_{yy} = 2, \tau_{yz} = 0 \quad \text{Determine the principal strains and their directions}$$
$$\varepsilon_{zz} = -1, \tau_{zx} = 0$$

10

3   (i)   What is corrosion ? List the various types of corrosion . Explain cavitation

corrosion and methods to prevent it   10

(ii)   What is the significance of compatibility equations?

Prove the compatibility equations

$$\frac{\partial^2 \gamma_{xy}}{\partial x \partial y} = \frac{\partial \varepsilon_{xx}}{\partial y^2} + \frac{\partial \varepsilon_{yy}}{\partial x^2}$$

10

4   (i)   The stress tensor is given by

$$\sigma_x = 100 N / mm^2, \sigma_y = 50 N / mm^2, \sigma_z = -500 N / mm^2$$
$$\tau_{xy} = -400 N / mm^2, \tau_{YZ} = 50 N / mm^2, \tau_{zx} = 0$$

10

Find the strain tensor, Take $E = 2 \times 10^5 N / mm^2$ and $v = 0.28$

(ii)   Write short note on a tension load cell   10

TURN OVER

5   (i)   Draw a neat sketch of Wheat stone circuit and prove that   10

$$\Delta E = \frac{Vr}{(1+r)^2} \left[\frac{\Delta R_1}{R_1} - \frac{\Delta R_2}{R_2} + \frac{\Delta R_3}{R_3} - \frac{\Delta R_4}{R_4} \right]$$

(ii)   Define a strain rosette and explain the different types of strain rosette configurations   10

6   Write short notes on (Any Two)

(i)   What are the types of load consider on an elastic body? Draw the diagram to show the different stress on elastic body   10

(ii)   What are the types of corrosion? Explain methods to improve corrosion resistance   10

(iii)   Explain the construction and use of "CRO" tube for the dynamic strain measurement   10

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