Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ME) (E-I 2011 Onwards) (Sem.–6)

EXPERIMENTAL STRESS ANALYSIS

Subject Code : DE/ME-3.5

M.Code : 71267

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) What are principal planes? State their significance.

b) Classify the strain gauges on the basis of gauge construction.

c) State the factors affecting the gauge relation.

d) Describe the use of compensation techniques in two dimensional photoelasticity.

e) List the properties which an ideal photoelastic material should exhibit.

f) State Neuman's strain optic relationship.

g) How atomospheric parameters affect the performance of brittle coatings?

h) Define sensitivity of birefringence coating.

i) State gauge relation and the factors affecting it.

j) What do you understand by fringe multiplication? What is its effect in photoelasticity?

SECTION-B

2. Describe the potentiometer circuit and its application to strain measurement.

3. Describe the arrangement of optical elements in a circular polariscope along with a neat sketch. Also, state the four different arrangements for circular polariscope and recommend these arrangements for dark field and light field arrangements.

4. Describe the stress freezing method for three dimensional photoelasticity.

5. Describe gauge sensitivities and gauge factor. What are transverse strain effects in electric resistance strain gauges? How are the corrections for these effects achieved?

6. Describe the birefringence coating with application, methodology and parameters affecting the birefringence coatings.

SECTION-C

7. Describe the method of brittle coating and its calibration. Describe the brittle coating crack patterns with the help of sketches for the following cases of principal stress :

   a) $\sigma_1 = \sigma_2 > 0, \sigma_3 = 0$

   b) $\sigma_1 > 0, \sigma_2 < 0, \sigma_3 = 0$

   c) $\sigma_1 > \sigma_2 > 0, \sigma_3 = 0$

8. The strain components at a point in a three-dimensional steel component subjected to arbitrary loadings are given as: state of stress at a point are $\varepsilon_{xx} = 240$, $\varepsilon_{yy} = 320$, $\varepsilon_{zz} = 0$, $\gamma_{xy} = 140$, $\gamma_{yz} = 640$, $\gamma_{zx} = 90$. Determine the corresponding stress components and principal stress. Consider Young's modulus of elasticity = 210 GPa and shear modulus = 78 GPa.

9. Write short notes on the following :

   a) Stress transformation

   b) Birefringence coatings

   c) Stress separation in photoelasticity

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.