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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:

- 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?

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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

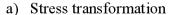
7. Describe the method of brittle coating and its calibration. Describe the brittle coating crack patterns with the help of sketches for the following cases of principal stress:

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:



b) Birefringence coatings

c) Stress separation in photoekisticity

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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.

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