

M.E. Second Semester (Mechanical Engineering (Adv. Manu. & Mech. Sys. Desig.)) (New-CGS)  
**13472 : Experimental Stress Analysis : 2 MMD 4**

P. Pages : 2

Time : Three Hours



**AW - 3830**

Max. Marks : 80

- Notes :
1. All question carry marks as indicated
  2. Answer **three** question from Section A and **three** question from Section B.
  3. Due credit will be given to neatness and adequate dimensions.
  4. Assume suitable data wherever necessary.
  5. Illustrate your answer necessary with the help of neat sketches.
  6. Use of pen Blue/Black ink/refill only for writing the answer book.

**SECTION - A**

1. a) Which are the four different arrangements of circular polariscope to obtain dark and light field ? 6  
b) Determine relative retardation in QWP designed for operation for mercury light ( $\lambda = 5481 \text{ \AA}$ ) if it is employed with sodium light ( $\lambda = 5893 \text{ \AA}$ ). 7
2. a) Define isoclinics and isochromatics and explain their significance. 6  
b) What is birefringence ? Explain with neat sketch. 7
3. a) Explain Tardy method of compensation to get frictional fringes. 6  
b) Derive expression for a stressed photoelastic model in a plane polariscope. 7
4. a) Explain Frozen Stress method in three dimensional photoelasticity. 5  
b) For a reflection polariscope experiment at a point on the surface, a fringe order of 2.8 is observed, calculate corrected difference of principal strains at the given point if ;  
for specimen :  $E_s = 210 \text{ GPa}$ ,  $\mu_s = 0.30$   
for coating :  $E_c = 2.7 \text{ GPa}$ ,  $\mu_c = 0.34$   
Coating thickness = 4 mm , and  
Material fringe value = 1.2 N/mm  
Also take specimen of 10 mm thickness. 8
5. Derive condition for extinction of light through circular polariscope with stressed model using dark field arrangement. 14

**SECTION - B**

6. a) What are the basic characteristics of strain gauge ? Explain in details. 5  
b) Derive an expression for gauge factor of an electrical resistance gauge of length (L), cross-sectional area (A), resistance (R) and resistivity (P). 8
7. a) What is strain rosette ? Explain different rosettes configurations in use ? 5

- b) A delta rosette is cemented on surface of a body. Three gauges A, B & C making an angle  $0^\circ$ ,  $120^\circ$  and  $240^\circ$  record  $\epsilon_A = -400 \mu\text{m}$ ,  $\epsilon_B = 800 \mu\text{m}$  and  $\epsilon_C = -600 \mu\text{m}$ . Determine principal stress  $E = 200 \text{ GPa}$ ,  $\mu = 0.3$  8
8. a) Explain Moire Fringe technique using geometrical approach. 5
- b) When two gratings of pitch density 40 line/mm is given a slight rotation ( $\theta$ ) with respect to second grating of same pitch. Moire Fringe formed making an angle ( $\phi$ ) w.r.t. second grating. Determine the angle ( $\theta$ ) and inter fringe spacing ( $\delta$ ), if the angle ( $\phi$ ) is equal to -  
i)  $70^\circ$  and ii)  $110^\circ$  8
9. a) Discuss briefly the factors affecting the behaviour of stress coat. 5
- b) Calculate coating stresses if specimen stresses are 80 MPa and 45 MPa, assume  $E_S = 210 \text{ GPa}$ ,  $E_C = 2.1 \text{ GPa}$ ,  $\mu_S = 0.30$ ,  $\mu_C = 0.42$ . 8
10. Explain in brief : 14
- i) Fixing of strain gauges.
  - ii) Types of strain rosettes.
  - iii) Potentiometer circuit.
  - iv) Types of brittle coatings.

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