

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

P. Pages : 2

Time : Three Hours



AW - 3559

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) If a particular point in a photoelastic model is observed in a mercury light source ($\lambda = 5481 \text{ \AA}$) fringe order (N) = 3 is obtained, what will be fringe order if sodium light ($\lambda = 5893 \text{ \AA}$) is used? **8**
b) What is stress optic law? Derive the expression for it. **6**
2. a) What is wave plate? How plane circularly and elliptically polarized light can be obtain by using it? **5**
b) Explain oblique incidence method of separating the principal stresses. **8**
3. a) What is time edge effect in photoelastic materials? How it can be eliminated? **6**
b) Determine material fringe value of a photoelastic tensile specimen 10 mm wide and 5mm thick following observations are obtained during calibration experiment. **7**

Load (N)	96	170	255	410	635
Fringe order	1	2	3	4	5

4. a) Explain shear difference method for separating principal stresses. **6**
b) Explain frozen stress method in three dimensional photo elasticity. **7**
5. Explain the following in detail; **13**
 - i) Isochromatic and Isoclinic
 - ii) Separation Techniques
 - iii) Photoelastic materials.

SECTION - B

6. a) Which are various types of strain gauges? Explain their merits and demerits. 6
- b) Explain strain sensitivity and related strain sensitivities of gauges. 7
7. a) What is strain rosette? Which are different strain rosette configurations in use? Explain with neat sketches. 6
- b) A strain gauge has gauge length of 20 mm and looped around to a radius of 0.3 mm. Calculate cross sensitivity factor, if gauge is used on steel for which $\epsilon_{yy}/\epsilon_{xx} = 0.3$. Calculate corrected gauge factor if prescribed gauge factor is 2.1, what will be gauge factor if $\epsilon_{yy}/\epsilon_{xx} = 0.8$? 8
8. a) Explain Moire method of whole field strain analysis. 6
- b) A grating is given a slight rotation (θ) with respect to a second grating of same pitch, Moire fringe is formed making an angle (ϕ) with respect to a second grating. Both the gratings are of pitch 25 lines/mm. Determine the angle (θ) and inter fringe spacing (δ), if angle (ϕ) is equal to
- i) 50° and ii) 90°
9. a) Explain brittle coating method. Discuss its merits and demerits. 6
- b) Calculate coating stresses if specimen stresses are 80 MPa and 45 MPa, assume $E_S = 210$ GPa, $E_C = 2.1$ GPa, $\mu_S = 0.30$, $\mu_C = 0.42$ 7
10. a) Explain in details; 13
- i) Wheatstone Bridge
- ii) Optical strain gauge
- iii) Types of strain rosettes
- iv) Mechanism of formation of Moire fringes.
