AQ–2862

Faculty of Engineering & Technology

M.E. (Mech. Engg.) (Adv. Manu. & Mech. Sys. Desig.) Semester-II (New-CGS) Examination

EXPERIMENTAL STRESS ANALYSIS

Paper—2 MMD 4

Sections—A & B

Time—Three Hours] [Maximum Marks—80

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Answer **THREE** questions from Section A and **THREE** questions from Section B.

(3) Due credit will be given to neatness and adequate dimensions.

(4) Assume suitable data wherever neccssary.

(5) Illustrate your answers wherever necessary with the help of neat sketches.

(6) Use pen of 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 (λ = 5481 Å) if it is employed with sodium light (λ = 5893 Å). 7

2. (a) What is wavc plate ? How plane, circularly and elliptically polarized light can be obtained using wave plate ? 5

   (b) Derive expression for a stressed model in a plane polariscope. 8

3. (a) Explain shear difference method of separating the principal stresses. 5

(Contd.)

(b) Determine material fringe value of a photoelastic tensile specimen 10 mm wide and 5 mm thick. Following observations are obtained during calibration experiment :

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

8

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 GPa, μ_S = 0.30

For coating : E_C = 2.7 GPa, μ_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) 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) Determine principal stresses for a delta rosette with three gauges A, B and C making angles 0°, 120° and 240° cemented on the surface of a body. Gauges record ϵ_A = –400 μm, ϵ_B = 800 μm and ϵ_C = –600 μm. Take E = 210 GPa and μ = 0.30. 7

8. (a) Explain Moire method of whole field strain analysis. 5

(b) When two gratings of pitch density 40 line/mm is given a slight rotation (θ) w.r.t. second grating of same pitch, Moire Fringe formed making an angle (ϕ) w.r.t. second grating. Determine the angle (θ) and inter fringe spacing (δ), if the angle (ϕ) is equal to (i) 70° and (ii) 110°. 8

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, μ_s = 0.30, μ_c = 0.42. 7

10. (a) Explain with neat sketches wire type and foil type electrical resistance strain gauges. 6

(b) Write short notes on following :

(i) Types of brittle coatings

(ii) Wheatstone bridge circuit. 8