

Unit 11 - Week 9

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Assignment 9

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-04-01, 23:59 IST.

1) Which is the most preferred calibration specimen for calibrating a photoelastic coating: 1 point

- Disc under diametral compression
- Cantilever beam under bending
- Beam under four-point bending
- Beam under three-point bending

No, the answer is incorrect.
Score: 0

Accepted Answers:
Cantilever beam under bending

2) The crack patterns formed on a white-washed wall is shown in the figure. What can one say about the stress state from the figure: 1 point



- $\sigma_1 > 0, \sigma_2 > 0, \sigma_3 = 0$
- $\sigma_1 > 0, \sigma_2 < 0, \sigma_3 = 0$
- $\sigma_1 = \sigma_2 > 0, \sigma_3 = 0$
- $\sigma_1 > 0, \sigma_2 = \sigma_3 = 0$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $\sigma_1 = \sigma_2 > 0, \sigma_3 = 0$

3) A planar specimen is coated with a brittle coating. Considering the Poisson's ratio mismatch, when the specimen is subjected to uniaxial stress, the coating stress would be: 1 point

- Zero
- Uniaxial
- Biaxial
- Triaxial

No, the answer is incorrect.
Score: 0

Accepted Answers:
Biaxial

4) Select the correct statements about brittle coatings: 2 points

- Brittle coatings are sensitive to the duration of load application
- In brittle coatings, each cycle of loading, inspection of cracks and unloading must be done within the same time interval
- The most critical cracks in brittle coatings are the ones that form when the final load increment is applied
- The initial cracks formed in the brittle coatings represent stress concentration zones
- The initial load increment should be small enough so that only localized regions have crack formation
- The accuracy achievable by using brittle coatings is estimated to be $\pm 20\%$

No, the answer is incorrect.
Score: 0

Accepted Answers:
Brittle coatings are sensitive to the duration of load application
In brittle coatings, each cycle of loading, inspection of cracks and unloading must be done within the same time interval
The initial cracks formed in the brittle coatings represent stress concentration zones
The initial load increment should be small enough so that only localized regions have crack formation
The accuracy achievable by using brittle coatings is estimated to be $\pm 20\%$

It is proposed to conduct a photoelastic coating test of an aircraft landing gear. One of the first steps in a photoelastic coating test is to determine the strain coefficient K of the coating. Displacement controlled cantilever is an ideal model for calibration. The cantilever beam (thickness = 5 mm, width = 25 mm and length = 250 mm) is of the same Aluminium alloy $E_s = 71 \text{ GPa}$; $\nu_c = 0.33$ as that of the landing gear

A small strip of photoelastic coating material $E_s = 2600 \text{ GPa}$; $\nu_c = 0.38$ of thickness 3 mm is bonded onto the Aluminium alloy cantilever specimen. The model is illuminated with white light and the fringe order obtained at a section 50 mm from the fixed end is as follows:

Displacement, y mm	1	2	3	4	5	6
Fringe order, N	0.3	0.5	0.8	1	1.3	1.6

Answer the following questions based on the comprehension:

5) Correction factor for bending is :

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.60,0.85

6) Slope obtained from Fringe order N vs. displacement y plot is:

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.18,0.30

7) The strain-optics coefficient K is:

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.09,0.20

Calibration test of a brittle coating is carried out on an aluminium cantilever specimen and the test revealed that the threshold strain of the brittle coating is $300\mu\epsilon$. It is of interest to know the corresponding state of stress in the coating during calibration.

At the point, where the brittle coating is applied, the Aluminium specimen stresses are found to be $\sigma_1^i = 250 \text{ MPa}$ and $\sigma_2^i = -200 \text{ MPa}$.

The material properties of the coating are $E_c = 1.45 \text{ GPa}$ and $\nu_c = 0.42$

Material properties of Aluminium are $E_a = 70 \text{ GPa}$, $\nu_a = 0.33$

Answer the following questions based on the comprehension:

8) The failure stress σ_0^c of the coating in MPa is:

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.36,0.56

9) Coating stress σ_1^c in MPa is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 3.50,6.00

10) Coating stress σ_2^c in MPa is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) -5.00,-2.50

In the field, the coating is applied on a mild steel specimen having a Young's modulus of 210 GPa and a Poisson's ratio of 0.26. Considering this case, answer the following questions :

11) Specimen stress σ_0^s (in MPa) to cause the coating to fail is:

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 58.00,63.00

12) If the calibration specimen was also made of mild steel, then what would be the specimen stress σ_0^s (in MPa) to cause coating failure:

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 60.00,66.00

2 points