KUMARAGURU
college of technology
character is life

B.E DEGREE EXAMINATIONS: APRIL 2018

(Regulation 2014)

Eighth Semester

AERONAUTICAL ENGINEERING

U14AEE802: Experimental Stress Analysis

COURSE OUTCOMES

CO1: Determine the structural properties (stress, strain) using various experimental techniques.

CO2: Formulate and solve general three dimensional problems of stress-strain analysis especially fundamental problems of elasticity.

CO3: Analyze the strain gauge data under various loading condition by using gauge rosette method.

CO4: Apply experimental techniques of stress analysis using photoelasticity and strain gauges.

CO5: Experimentally evaluate the location and size of defect in solid and composite materials by using various Non-destructive Testing methods.

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Matching type item with multiple choice code   CO5   [K_1]

List I	List II
A. Dye Penetrant Testing	i. Applicable for metallic, non-metallic, magnetic or nonmagnetic.
B. Magnetic Particle Testing	ii. Photographic record produced by x-rays or γ-rays.
C. Ultrasonic Testing	iii. Applicable for only surface breaking defects.
D. Radiography	iv. Applicable for only ferrite material.

	A	B	C	D
a)	iii	iv	ii	i
b)	iii	iv	i	ii
c)	iii	ii	i	iv
d)	ii	iii	iv	i

2. _____ is the closeness to the measurement of true value   CO1   [K_1]

a) Accuracy   b) Precision

c) Sensitivity   d) Endurance

3. Gauge Factor is the ratio of relative change in _____ to the mechanical strain   CO3 [K$_2$]

   a) Electrical Resistance   b) Electrical Capacitance

   c) Electrical Inductance   d) Electrical Impedance

4. What is the correct angle arrangement for four element rectangular rosette?   CO3 [K$_1$]

   a) 0,45,90,135   b) 0,30,60,90

   c) 0,60,90,120   d) 0,40,80,120

5. Quarter wave plate are used to convert the plane polarized light into _____   CO2 [K$_2$]

   a) Circular polarized light   b) Partially polarized light

   c) Elliptically polarized light   d) Un polarized light

6. _____ are the locus of points in the specimen along which the principal stresses are in same direction.   CO4 [K$_2$]

   a) Isoclinic   b) Isochromatic

   c) Birefringence   d) All of the above

7. Assertion (A): Accuracy is the closest to the true value.   CO1 [K$_2$]

   Reason (R): Precision is the closest to the true value.

   a) both A and R are individually true and R is the correct explanation of A   b) both A and R are individually true but R is not the correct explanation of A

   c) A is true but R is false   d) A is false but R is True

8. Identify the radioactive source used in radiography testing   CO5 [K$_2$]

   a) Te-129   b) Cs-137

   c) U-238   d) Cu-247

9. Rearrange the circular polariscope setup arrangement.   CO4 [K$_3$]
   1. Polarizer
   2. Quarter wave plate
   3. Analyser
   4. Photoelastic model

   a) 1-2-3-4   b) 1-2-4-3

   c) 4-3-1-2   d) 4-2- 1-3

10. **Assertion (A):** Isoclinic are the locus of points in the specimen along which the principal stresses are in same direction.   CO4 [K$_2$]
    Reason (R): Isochromatics are the loci of the points along which the difference in the first and second principal stress remains the same.

    a) both A and R are individually true and R is the correct explanation of A   b) both A and R are individually true but R is not the correct explanation of A

    c) A is true but R is false   d) A is false but R is True

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11.	Classify the mechanical extensometers depending upon the manner of obtaining the magnification.	CO1 [K₁]
12.	Define gauge factor.	CO3 [K₂]
13.	What are the methods are available for computing the strain rosette data?	CO1 [K₁]
14.	Define sensitivity of potentiometer.	CO3 [K₂]
15.	What is the basic principle for photo elasticity?	CO2 [K₂]
16.	Give the most commonly used methods for compensation techniques	CO4 [K₁]
17.	What is plane of polarization?	CO4 [K₂]
18.	What are the limitations of NDT?	CO5 [K₂]
19.	What are the advantages of Radiographic inspection	CO5 [K₁]
20.	Give some advantages of fiber optic sensors.	CO5 [K₂]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21.	Explain the principles of measurement with reference to accuracy, precision, reproducibility, repeatability and sensitivity.	CO1 [K₂]
22.	Explain Huggenberger extensometer and Berry strain gauge in detail.	CO1 [K₂]
23.	What are the different types of electrical resistance strain gauges? Explain about the unbonded strain gauge.	CO3 [K₂]
24.	The strain readings as measured by a T-delta rosette at a point in a stressed aluminum body are given by: ε_a = 355 µm/m, ε_b = -276 µm/m, ε_c = 233 µm/m, and ε_d = -185 µm/m. Determine the principal stresses, maximum principal stress direction and maximum shear stress.	CO3 [K₃]
25.	Sketch a circular polariscope. Explain the effects of a stressed model loaded in a dark field setup	CO4 [K₂]
26.	Explain any two compensation techniques used in photo elasticity.	CO2 [K₂]
27.	Explain with neat diagrams (i) Eddy Current Testing. (7) (ii) Magnetic Particle Inspection. (7)	CO5 [K₂]

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