Register Number:……..

KUMARAGURU college of technology
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B.E DEGREE EXAMINATIONS: N0V/DEC 2023

(Regulation 2018)

Seventh Semester

AERONAUTICAL ENGINEERING

U18AEE0010: Experimental Stress Analysis

COURSE OUTCOMES

CO1: Identify the parameters that control the behavior and response of a measurement system.

CO2: Measure the change in length of the solid materials using suitable extensometers.

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

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

CO5: Identify the location and size of defect in structural materials using NDT.

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 CO3 [K_2]

Grid Materials	Composition
A. Constantan	i. Ni - 80% ; Cr – 20%
B. Elinvar	ii. Ni – 45%; Cu – 55%
C. Nichrome	iii. Ni– 36%; Fe-55.5%;Cr–8%; Mo– 0.5%
D. Karma	iv. Ni – 74%; Fe-3%; Cr –20%;Al-3 %

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

2. What is the other name of Inductance Strain Gauge? CO1 [K_1]

a) Eddy Current Strain Gauge b) Magnetic Strain Gauge

c) Interferometer Strain Gauge d) Diffraction Strain Gauge

3. Gauge length is considered to be more important for …….strains. CO3 [K_1]

a) Linear b) Non-linear

c) Curvilinear d) Power series

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. Which one of the following is not a separation method of principal stresses? CO4 [K_1]

a) Shear difference method b) Analytic separation method

c) Relaxation method d) Stress difference method

6. _____ are the locus of points in the specimen along which the principal stresses are in same direction. CO4 [K_1]

a) Isoclinic b) Isochromatic

c) Sink Points d) Source Points

7. Static as well as dynamic strain can be measured more accurately in CO1 [K_1]

a) Electrical strain gauge b) Mechanical strain gauge

c) Acoustical strain gauge d) optical strain gauge

8. Which one is most suitable method to detect cracks? CO5 [K_2]

a) Ultrasonic b) Dye penetrant technique

c) Magnetic particle inspection d) Fluorescent penetrant technique

9. Rearrange the plane polariscope setup arrangement. CO4 [K_2]

1. Light source

2. Polarizer

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):** Permanent carriers are generally manufactured from organic materials CO3 [K_2]
Reason (R): Temporary carriers are used where environmental conditions are not suitable to the organic carriers.

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.	Define precision of a measuring instrument.	CO1	[K_1]
12.	How we can measure the temperature changes?	CO1	[K_2]
13.	Define Gauge factor.	CO2	[K_1]
14.	What are the basic requirements for extensometer?	CO2	[K_2]
15.	Give the expression for strain measured by a strain gauge in particular angles.	CO3	[K_2]
16.	Write the most commonly used methods for compensation techniques.	CO4	[K_1]
17.	What is plane of polarization?	CO4	[K_2]
18.	What are the techniques used to determine the stresses at the inner layers of the body in 3D photo elasticity?	CO5	[K_2]
19.	What are the advantages of Radiographic inspection?	CO5	[K_1]
20.	Give some advantages of fiber optic sensors.	CO5	[K_2]

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

21.	What are the different types of electrical resistance strain gauges? Explain about the unbonded strain gauge.	14	CO2	[K_2]
22.	Explain in detail about the working principle and measurement of strains from an acoustical strain gauge with a neat sketch	14	CO1	[K_2]
23.	The strain readings as measured by a T-delta rosette at a point in a stressed aluminum body are given by: £a = 355 µm/m, $£_b$ = -276 µm/m, £c = 233 µm/m, $£_d$ = -185 µm/m, E=70GPa and ν =0.3. Determine the principal stresses, maximum principal stress direction and maximum shear stress.	14	CO3	[K_4]
24.	Sketch a circular polariscope. Explain the effects of a stressed model loaded in a dark field setup	14	CO4	[K_2]
25.	Explain any two compensation techniques used in photo elasticity	14	CO4	[K_2]
26.	Explain with neat diagrams (i) Dye Penetrant Technique. (ii) Ultrasonic Testing.	14	CO5	[K_2]

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