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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

First Semester, M.Tech - Mechanical Engineering (MMDN)

Semester End Examination; Jan - 2017

Experimental Mechanics

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Classify different errors encountered in measurements. Discriminate these with examples. 8

b. The following data are collected for a certain measurement. Obtain *y* as a linear function of *x* using the method of least squares. 12

x	1.2	2	2.4	3.5	4.2
y	1	1.6	3.4	4	5.2

2 a. With the aid of a block diagram, describe functions of various components of a data acquisition system. 8

b. Describe the following with reference to statistical analysis of data : 12

i) Binomial distribution ii) Correlation coefficient.

UNIT - II

3 a. Derive the condition for balancing in a Wheatstone's bridge. 8

b. Use the equation derived above to derive expression for open circuit voltage ΔE for an unbalanced bridge. 12

4 a. What is Gauge factor? Derive the relationship between Gauge factor and Bridgeman constant for an electrical resistance strain gauge. 8

b. The following readings were recorded in a three-element rectangular rosette, $\varepsilon_a = 250\ \mu(0^o)$, $\varepsilon_B = -160\ \mu(45^o)$ and $\varepsilon_C = -50\ \mu(90^o)$. Compute the principal strains, principal stresses and their directions. If the cross-sensitivity factor K = 0.01, what would be the change in true strains? 12

UNIT - III

5 a. Contrast Isoclinics and Isochromatics by deriving relevant expressions using stressed model in a plane Polariscope. 10

b. Discuss fringe compression. Explain Tardy's method of finding fractional fringe order. 10

6 a. Derive expression for intensity of light coming out of analyser in a circular Polariscope. Prove that the order of first fringe observed under light-field arrangement is ½. 12

b. Identify the required properties of an ideal photo elastic material. Name the commonly employed photo elastic materials. Write their advantages. 8

Contd….2

UNIT - IV

7 a.	Explain any two methods of crack detection in brittle coating method.	8
b.	Show that the difference in principal stresses in a birefringent coating is linearly related to the difference in principal stresses acting on the surface of a loaded member.	12
8 a.	With a sketch, explain how strain at a point on the surface of loaded member is measured by brittle coating technique?	12
b.	A coating of epoxy resin 2.5 mm thick with a fringe-strain coefficient of 4.3 μm/m/fringe is applied to a machine part made of steel (E = 200 GPa, v = 0.3). Find the stress sensitivity index. Also find the maximum strain difference and optical response observed in the birefringent coating, if σ_Y = 240 MPa.	8

UNIT - V

9 a.	Explain the recording and reconstruction process in holography.	10
b.	With the help of sketch, explain any one method of remote grating technique to obtain Moire pattern.	10
10a.	Explain the geometrical approach for Moire fringe analysis in case of pure extension.	8
b.	What are Isopachics? Derive the equation for the same for a plane-stress model.	12

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