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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/Feb - 2016

Experimental Mechanics

Time: 3 hrs

Max. Marks: 100

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

UNIT - I

1. a. Explain five different errors to be taken into account during Analog to Digital conversion of an experimental signal. 10
- b. Explain Chi – Square test and method of least squares employed in statistical conditioning of experimentation data. 10
2. a. With the help of a block diagram explain data acquisition and processing system making use of a Digital Memory. 5
- b. Explain the three phases or stages of a generalized measuring system with relevant examples. 10
- c. Classify and list out the different causes of errors during any experimentation process. 5

UNIT - II

3. a. Define electrical resistance strain gauges and list out any three basic characteristics it. 4
- b. Define sensitivity of a potentiometer, show that sensitivity increases as the value of $\left(\frac{r}{1+r}\right)$ increases, where r = ratio of resistance. 6
- c. consider a three element rectangular rosette A, B, C arranged in such a way that gauge B makes an positive angle of 40° with gauge A, and gauge C makes a positive angle of 90° with gauge A. the strain readings from the three gauges are given as ϵ_A , ϵ_B and ϵ_C respectively. Find the expression for determining principal stresses and maximum shear stress. 10
4. a. What is the necessity of weldable strain gauges, with proper sketch explain quarter bridge gauge. 5
- b. Why is temperature compensation necessary for a strain gauge? Explain self temperature compensated gauge. 5
- c. Define and derive an expression for the gauge factor of an electrical conductor of length L, cross-sectional area A, resistance R and resistivity ρ . Why for some materials the value of gauge factor is far away from normal value of 2.0? 10

UNIT - III

5. a. Define frequency, Refractive index of a medium and phase with respect to wave theory of light. 4

Contd....2

- b. What do you understand by fringe sharpening in photo elasticity? 6
- c. Describe the effect of a stresses model in a circular polariscope using dark field setup. 10
- 6 a. Explain production of polarized light using Nicol prism. 6
- b. Define stress optic law and show the relationship between stress and optical effect in 2D photo elasticity. 5
- c. With a neat sketch explain babinet soleil compensation method. 5
- d. List any four important properties exhibited by Isoclinics in photo elasticity. 4

UNIT - IV

- 7 a. What are the ideal properties of a birefringent coating material should possess. 5
- b. Write note on isostatics and isoentatics. 5
- c. Explain Birefringent strip-coating method used in separation of principal stresses with relevant sketches. 10
- 8 a. With a schematic diagram describe reflection polariscope. 8
- b. List out the variables influencing the accuracy of brittle coating method. 5
- c. With the help of a standard calibrating beam explain the static calibration of brittle coating materials. 7

UNIT - V

- 9 a. Explain the principle of Holography and with relevant optical layouts describe recording and reconstruction process. 12
- b. Considering laser as source of illumination explain Temporal Coherence. 8
- 10 a. With a schematic optical layout explain real time holographic interferometry. 6
- b. Explain 'Moire phenomenon' with a neat diagram explain geometrical approach of moiré fringe analysis for pure extension with no rotation. 10
- c. List out any five applications and advantages of Moire method in stress analysis. 4

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