



Reg. No. :

Name :

First Semester M.Tech. Degree Examination, March 2013
(2008 Scheme)
Branch : Civil Engg.
CSC 1004 : EXPERIMENTAL STRESS ANALYSIS AND
INSTRUMENTATION

Time : 3 Hours

Max. Marks : 100

Instructions : Answer any five full questions.
All questions carry equal marks.
Assume suitable data wherever necessary.

1. a) Explain the components generalized measurement system with the help of one example. 7
- b) A second order instrument is subjected to sinusoidal input. Natural frequency is 5Hz and damping ratio is 0.6. Calculate the amplitude ratio and phase angle for an input frequency of 3Hz. 7
- c) Differentiate between accuracy and precision. 6
2. a) Derive an expression for the gauge factor of electric resistance strain gauge. 7
- b) A full bridge made up of 350 ohm gauges has a constant voltage power supply of 10V. The following resistors are shunted in turn across arm R_1 120050, 1050 ohms. Find the change ΔE . 8
- c) Explain the reasons of providing alloys for making electrical resistance strain gauge. 5
3. a) The following observations are made with a rectangular gauge bonded to steel with gauge aligned along x-axis : $\epsilon_0 = 120 \mu \text{ mm/mm}$; $\epsilon_{45} = 150 \mu \text{ mm/mm}$; $\epsilon_{90} = -320 \mu \text{ mm/mm}$; Determine the principal strains, principal stresses and principal angles. ($E = 200000 \text{ N/mm}^2$ and $\nu = 0.33$). 8
- b) Discuss the different Wheatstone bridge arrangements employed to obtain indications from a strain gauge. 7
- c) What is the principle of vibrating wire strain gauge ? 5



4. a) Explain the principle and working of LVDT. 6
- b) Describe the theory of operation of strain gauge based diaphragm type pressure transducer. 7
- c) Explain the integration technique used for deducing displacement from acceleration. 7
5. a) With the help of neat sketches derive the equation for light intensity passing through a stressed model in a plane polariscope. 7
- b) The stress fringe value for a material was determined to be 21.2 kN/m, when sodium light ($\lambda = 589.3\text{nm}$) was used in its determination. What would be the stress fringe value for the same material for mercury light ($\lambda = 548.1\text{nm}$) ? 7
- c) Explain the principle of Moire fringe method. 6
6. Write short notes on (4 mark each) :
- a) NDT using Ultrasonic pulse
- b) Computer based data acquisition
- c) Errors in measurements
- d) Detection of embedded rebars
- e) Calibration of accelerometers.
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