# **Question Paper**

Exam Date & Time: 02-May-2019 (02:00 PM - 05:00 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

### INTERNATIONAL CENTRE FOR APPLIED SCIECES IV SEMESTER B.Sc. (APPLIED SCIENCES) IN ENGINEERING END SEMESTER THEORY EXAMINATION-APRIL/MAY 2019

#### **METROLOGY AND MEASUREMENTS [IME 244 - S2]**

Marks: 100

Duration: 180 mins.

#### Answer ANY FIVE FULL questions. Use of Tolerance Table is permitted Missing data may be suitably assumed. 1) (8) Define the terms. 1. Precision A) 2. Accuracy 3. Resolution 4. Deadband B) (6) What is Hysteresis? Explain with sketch. How do you eliminate Hysteresis error. C) Determine minimum number of Slip gauges to give a dimension of 132.512 (6) mm using a standard set of slip gauge. The set has a pair of protector gauge of size 2mm.sketch the arrangement. 2) (8) With block diagram Explain Elements of generalized measurement system .Explain the functions of each elements. A) B) (6) Explain with sketch Platinum resistance thermometer. C) (6) Calculate the Limits for the Fit 55Mgg . The fundamental deviation for the hole is -(IT7-IT8) and for the shaft is 2.5D<sup>0.32</sup> state the types of fit and sketch the fit. 3) (6) Explain with sketch the Pressure Thermometer. A) B) (6) A Flat diaphragm of mild steel has a diameter of 5mm young's modulus 200Gn/m<sup>2</sup>, Poisson ratio 0.28 If the maximum stress 3D<sup>2</sup>P/16t<sup>2</sup> is not to exceed 200MN/m<sup>2</sup> when pressure is 300KN/m<sup>2</sup>. Find the deflection at center for a pressure of 150KN/m<sup>2</sup> C) What do you mean by calibration of strain gauge? Explain strain gauge (8) calibration using shunt resistance.

	A)	Explain the method of measuring straightness using spirit level and autocollimator.	
	В)	What do you mean by Temperature compensation of strain gauge? Explain the method of temperature compensation using Dummy gauge.	(6)
	C)	A metallic stain gauge has resistance of 2000hm and gauge factor 2.It is installed on an aluminum structure which has stress of 0.2GN/m <sup>2</sup> and young's modulus 68.7GN/m <sup>2</sup> .Determine change in resistance of strain gauge that would be caused by loading the material to yield point.	(6)
5)		Explain with sketch the Transmission Dynamometer.	(8)
	A) B)	Explain with neat sketch Radiation pyrometer.	(6)
	C)	4 strain gauges are mounted on tensile specimen. Calibration resistance connected is 800000 ohms to one of the resistance 1880hms and gauge factor 1.22.If strain gauge reads out as 150division,Calibration switch closes at 240 division when load is applied. What is the axial load in the specimen.	(6)
6)		Explain the method of testing Square ness by Engineers square testor.	(6)
	A)		(0)
	Б)	What is Best size wire? Derive an expression for best size wire.	(8)
	C)	Explain with neat sketch the measurement of Major diameter of screw thread using bench micrometer.	(6)
7)	Δ)	State and explain Taylors principles of gauge design. Write a note on gauge makers tolerance and wear allowances.	(8)
	B)	Derive an expression for a gauge factor of stain gauge. In the Elastic region show that the gauge factor is 2.	(6)
	C)	In the measurement of Surface finish 20 successive peak and valley are given as 24,26,05,20,14,11,27,35,17,32,43,06,13,15,23,27,09,18,21,29 micron. If these measurements are obtained over a length of 20mm,Determine CLA value RMS and R <sub>Z</sub> value.	(6)
8)	A)	Explain with neat sketch the $M_c$ -Leod gauge to measure low pressure. Derive an expression for applied pressure.	(10)
	B)	Explain with sketch the method of measuring strain in rotating shaft.	(10)

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