Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY
Summer Examination-2016

Subject Name : Mechanical Measurement & Metrology

Subject Code : 4TE04MMM1 **Branch: B.Tech (Mechanical)**

Semester : 4 **Date : 20/05/2016** **Time : 2:30 To 5:30** **Marks : 70**

Instructions:
(1) Instructions written on main answer book are strictly to be obeyed.
(2) Draw neat diagrams and figures (if necessary) at right places.
(3) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

a) The correction of the instrument reading is of _____magnitude as the error
(A) same
(B) same and opposite
(C) opposite
(D) opposite and less

b) The largest change in the measured variable which produces no instrument response is known as
(A) Dead zone
(B) Dynamic error
(C) Threshold
(D) Resolution

c) The 'GO' limit designation is applied to
(A) upper limit of shaft and lower limit of hole
(B) lower limit of shaft and lower limit of hole
(C) lower limit of shaft and upper limit of hole
(D) upper limit of shaft and upper limit of hole

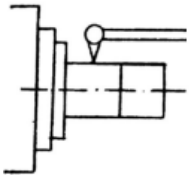
d) The bending of bi-metallic strips during rise in temperature is due to difference in their
(A) coefficient of linear expansion
(B) elastic properties
(C) thermal conductivities
(D) none of these

e) The difference between upper limit and lower limit of the dimension is known as
(A) Tolerance
(B) Deviation
(C) Fundamental error
(D) Lower deviation

f) NPL stands for
(A) National photo level
(B) National Physical Laboratory
(C) Non Parallel Line
(D) Not Perfect Linear

g) Grade 00 of slip gauges represents
(A) workshop grade
(B) precise work grade(C) standard room grade for higher precision
(D) inspection grade

h)



The figure shows which of the following alignment test of lathe
(A) leveling of machine
(B) axial slip of main spindle
(C) true running of locating cylinder of main spindle
(D) true running of headstock center

i) The number of atoms in a 0.012 kg mass of carbon-12 is known as
(A) gravity
(B) weight
(C) mass
(D) mole

j) The thickness of light gauge sheet steel can be best checked with a
(A) steel rule
(B) caliper
(C) depth gauge
(D) micrometer

k) The local velocity at a point in a channel of duct is measured by
(A) current meter
(B) flow nozzle
(C) vane anemometer
(D) pitot-static probe

l) Which of the following cannot be used for negative pressures
(A) Piezometer
(B) Pirani gauge
(C) U-tube manometer
(D) Bourdon tube pressure gauge

m) Manometers can be used to measure
(A) Gauge pressure
(B) differential pressure
(C) atmospheric pressure
(D) all of above

n) The overshoot of the instrument is due to
(A) weight

(B) mass and inertia
(C) dimension
(D) none of above

Q-2 (a) Give the classification of systematic errors. Discuss any one with suitable example. **7**

(b) Describe the construction and working of a ring balance meter and derive an equation for differential pressure. **7**

A new control weight is to be made for a ring balance meter. Given that the average radius of the ring is 200 mm, tube diameter is 100 mm and the distance of the weight from the center is 275 mm. Determine the value of control weight required in order that the maximum deflection of the ring is 30° when differential pressure of 200 mm water gauge is applied to the ring.

Q-3 (a) Explain the construction and working of 'type C' Vernier caliper and set the following reading using Vernier caliper of 0.02 mm least count. **7**

(i) 31.68 mm (ii) 10.20 mm

(b) Write a technical note on Optical pyrometers with neat sketch. **7**

Q-4 (a) Discuss in detail the Wringing of slip gauges with neat sketches. **5**

(b) Draw a block diagram of a measuring system for speed measurement using tachometer. **5**

(c) Give some of the desirable characteristics of a manometric liquid. **4**

Q-5 (a) Draw and discuss construction and working of strain gauge based on quarter bridge circuit. **5**

(b) Draw and discuss the different applications of sine bar. **5**

(c) Discuss the importance of calibration system in metrology laboratory. **4**

Q-6 (a) Explain calibration of liquid-in-glass thermometer with neat sketch. **5**

(b) Explain with neat sketch the working of Sigma comparator. **5**

(c) What is proving ring? How is it used to measure force? **4**

Q-7 (a) Enlist the various tests applied to nay machine tool. Explain leveling of the machine with neat sketch. **7**

(b) Using constant chord method derive the following equation of depth for helical gear **7**

$$m_n = \left(1 - \frac{\pi}{4}\right)\cos\phi_n \sin\phi_n .$$

Q-8 (a) Discuss the construction and working of dead weight pressure gauge tester. **7**

(b) Explain the construction of U-tube double column manometer . Derive the manometric equations for positive and negative pressures for it. **7**