Enrollment No: _____   Exam Seat No:_____

C.U.SHAH UNIVERSITY
Summer Examination-2019

Subject Name : Mechanical Measurement & Metrology

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

Semester: 4   **Date: 01/05/2019**   **Time: 02:30 To 05:30**   **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)**

i.   1 yard = _____ feet
         (A) 3 feet
         (B) 3.2 feet
         (C) 3.01 feet
         (D) 12 feet

ii.   Slip gauges are designed and developed based on which IS from the following?
         (A) IS: 3073 - 1967
         (B) IS: 2984 – 1966
         (C) IS: 2220 – 1962
         (D) IS: 2285 – 1963

iii.   Plug gauges are used to
         (A) measure the diameter of the workpiece
         (B) measure the diameter of the holes in the workpiece
         (C) check the diameter of the holes in the workpiece
         (D) check the outside diameter of workpiece

iv.   Which of the following is the most important characteristics of a measuring instrument
         in general
         (A) Precision
         (B) repeatability
         (C) accuracy
         (D) sensitivity

v.   Which of the following is not controllable errors
         (A) calibration errors
         (B) random errors
         (C) avoidable errors
         (D) environmental errors

vi.   A sine bar is used to measure
         (A) external tapers
         (B) surface roughness
         (C) gear profiles

(D) internal tapers
vii. A master gauge is
(A) a new gauge
(B) an international reference standard
(C) a standard gauge for checking accuracy of gauges used on shop floors
(D) the most accurate gauge

viii. Bubble is stable because atmospheric pressure inside and outside is
(A) equal
(B) different
(C) un measurable
(D) none of above

ix. Absolute zero on Kelvin scale is equal to
(A) 373 K
(B) 273 K
(C) 0 K
(D) None of the above

x. Which one of these thermometers is portable as well as simple to use?
(A) Constant-volume gas thermometer
(B) resistance thermometer
(C) Thermocouple
(D) Mercury-in-glass thermometer

xi. Input signals are amplified using _____
(A) rectifier
(B) amplifier
(C) oscillator
(D) All of these

xii. The function of a transducer is
(A) to amplify the input signal
(B) to modify the input signal
(C) to convert the primary signal into a more useful quantity usually an electrical impulse
(D) to codify the input signal

xiii. The strain gauge is not bonded to the specimen.
(A) True
(B) False
(C) not always true
(D) not always false

xiv. Which of the following represents obstruction type flow measuring systems?
(A) Centrifugal force type
(B) Rotating vane system
(C) Flow nozzle device
(D) None of the mentioned

Q-2 (a) Draw the block diagram of generalized measurement system. Explain each functional element in detail.   **14**

Q-3 (a) State the advantages and disadvantages of Vernier scale used in linear measurement   **7**

instructions.

(b) Derive the equations for depth and width of gear teeth using Constant Chord method. **7**

Q-4 (a) Draw and explain the types of fits used for hole basis and shaft basis systems. **7**

(b) Write advantages and disadvantages of Sine bar. **7**

Solve the numerical problem:

A sine bar has a length of 250 mm, each roller has a diameter of 20 mm. During taper angle measurement of a component, height from the surface plate to the center of a roller is 100 mm. Calculate taper angle.

Q-5 (a) List the various alignment tests applied to any machine tool. Explain with neat sketch any one alignment test of Lathe machine. **7**

(b) Draw and explain the working principle of Autocollimator. **7**

Q-6 (a) Explain the construction of Liquid-in-glass thermometers with neat sketch. Discuss with all necessary figures the calibration of thermometers. **7**

(b) Explain construction and working of Hot wire anemometer. **7**

Q-7 (a) Draw and discuss construction and working of Dead weight pressure gauge tester. **7**

(b) Derive the governing manometric equation $p_x - p_y = 2gh(\rho_2 - \rho_1)$ for U-tube double reservoir manometers. **7**

Q-8 (a) Discuss in detail the construction, working of Ring balance manometer and prove that $p_2 - p_1 = K \sin\theta$. **7**

(b) Draw the line diagram for the working of Total radiation pyrometers and discuss the characteristics of radiation pyrometers. **7**