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28/11/23 (AM)

Roll No: ----------

National Institute of Technology, Hamirpur (HP)
Department of Mechanical Engineering
END-SEMESTER EXAMINATION, Dec. 2023

Branch: B. Tech. (Mechanical Engineering) | Semester: 3rd
Course Name: Metrology and Measurements | Course Code: ME-214
Maximum Marks: 50 | Maximum Time: 03 hrs.

Note:

- **All questions are compulsory.**
- **The marks are mentioned inside the bracket against the respective question.**
- **Write to the point answer. Unnecessary long answer may reduce your marks.**

Q-1 Explain sigma comparators using suitable diagrams and define their advantages and disadvantages. **[5]**

Q-2. Explain surface roughness parameters as per ISO 4287 (1997) standards using suitable diagrams. **[5]**

Q-3. Demonstrate effective diameter or the pitch diameter can be measured by three wire method and derive the expression for it. **[2+3]**

Q-4. Explain Mechanical belt dynamometer and Gear dynamometer and derive the expression for torque measurement. **[2+3]**

Q-5. Justify, why platinum metal is widely used for metallic resistance thermometer and explain their working and relationship between temperature and resistance using suitable diagram. **[5]**

Q-6. In a limit system the following limits are specified to give a clearance fit between a shaft and a hole: **[5]**

Shaft = $30^{-0.005}_{-0.018}$ mm and Hole = $30^{+0.020}_{-0.000}$ mm.

Determine: **a**. Basic size **b.** Shaft and hole tolerance

c. The maximum and minimum clearance **d.** Shaft and hole limit.

Q-7. Write a short note: **2x10**

(a) Measuring of unknown angle with Sin bar using suitable diagram.

(b) Explain the terms: **a.** Fundamental deviation **b.** Fundamental tolerance.

(c) Why a unilateral tolerance system is generally preferred over bilateral system.

(d) When do you prefer cast iron surface plate over granite surface plates and vice-versa?

(e) Give the current definition of metre.

(f) Explain the working principle of a Dial Calliper.

(g) what is seismic device, explain using suitable diagram.

(h) What are the Functional and metrological features of pneumatic comparators using suitable diagram.

(i) Describe the behavior of Piezoelectric transducer for the function of accelerometer.

(j) Explain the working operation of Bourdon tube for pressure measurement using suitable diagram

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