Graphic Era HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

Term Evaluation (Odd) Semester Examination September 2025

Roll no.....

Name of the Course: **B.Tech., Mechanical Engineering**
Semester: **V**
Name of the Paper: **Mechanical Measurements and Metrology**
Paper Code: **TME 510**
Time: 1.5 hour **Maximum Marks: 50**

Note:
(i) Answer all the questions by choosing any one of the sub-questions
(ii) Each question carries 10 marks.

Q1. **(10 Marks)**

a. Define the following standards and explain their historical importance in the development of accurate length measurement:
a) International Prototype Meter
b) Imperial Standard Yard
c) Wavelength Standard **(CO1)**

OR

b. Define tolerance. Explain its importance in manufacturing. Discuss how tolerance specifications influence assembly, product quality, and cost of manufacturing. **(CO2)**

Q2. **(10 Marks)**

a. Explain the process of transfer of measurement from a line standard to an end standard. Why is this transfer important? **(CO1)**

OR

b. Explain the principle of interchangeability and selective assembly with suitable examples. In what situations is selective assembly preferred over complete interchangeability? **(CO2)**

Q3. **(10 Marks)**

a. Write a short note on the Indian Standards of Slip Gauges, specifically:
i) M-87 Set
ii) M-112 Set
Mention their composition and applications. **(CO1)**

OR

b. Discuss compound tolerances and accumulation of tolerances with suitable examples from mechanical assemblies. Why is tolerance stack-up analysis important in design? **(CO2)**

Q4. **(10 Marks)**

a. Calibration of End Bar
Given:
Nominal Length = 150.00 mm
Comparator Reading = 0.005 mm
Calibration temperature = 25 °C
Reference temperature = 20 °C
Coefficient of thermal expansion (α) = 11×10^{-6} /°C
Calculate the corrected length of the end bar. **(CO1)**

OR

b. Explain geometrical tolerances and positional tolerances with the help of symbols and sketches. How are they different from dimensional tolerances? **(CO2)**

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Q5. **(10 Marks)**

a. Building of Slip Gauges: Build a length of 69.48 mm using the minimum number of slip gauges from a metric M-87 set. (Note: Show selection logic from 1.0 mm, 1.005 mm, 1.01–1.49 mm (0.01 mm step), 1.5–24.5 mm (0.5 mm step), 25–100 mm (1 mm step)). **(CO1)**

OR

b. What are fits? Explain the classification of fits (clearance fit, transition fit, interference fit) with neat diagrams. Also write their ISO system of designation. **(CO2)**