Name: **Enrolment No:**	

UPES

End Semester Examination, May 2025

Course: Mechanical Measurement and Metrology **Semester: VI**

Program: B.Tech Mechanical Engineering **Time : 03 hrs.**

Course Code: MEPD3024 **Max. Marks: 100**

Instructions: Use graph paper for the plots.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Define transducer and actuator with examples.	**4**	**CO1**
Q 2	Define with example: unilateral tolerance, bilateral tolerance, and Compound tolerance.	**4**	**CO1**
Q 3	Write the application of the plain plug gauge and snap gauge.	**4**	**CO1**
Q 4	Explain precision vs accuracy with examples.	**4**	**CO4**
Q 5	Discuss the applications of the following tolerance grades: a) IT2; b) IT10	**4**	**CO4**

SECTION B

(4Qx10M= 40 Marks)

Q 6	a) Define transducer and actuator with examples. b) What are the classifications of transducers? c) Write the characteristics of a transducer.	**10**	**CO1**
Q 7	a) Write the working principle of Thermocouple and Thermistor. b) What do you understand by cold junction compensation for a thermocouple measurement? [7+3 marks]	**10**	**CO2**
Q 8	A pitot-static tube is used to measure the wind speed inside a wind tunnel. The two ports of the pitot-static tubes are connected to a digital differential manometer, which displays an output of 4 Volts. The sensitivity of the manometer is 50 pascals per volt. Calculate the value of wind speed in the wind tunnel. The density of air is 1.2 kg/m^3.	**10**	**CO2**

<table>
<tr><td>Q9</td><td>Write a short note on particle image velocimetry (PIV). What is its application and advantage? What are the different components of a PIV system?
OR
Write the working principle of a strain gauge. Derive the expression for the gauge factor of a strain gauge.</td><td>10</td><td>CO2</td></tr>
<tr><td colspan="4">SECTION-C
(2Qx20M=40 Marks)</td></tr>
<tr><td>Q 10</td><td>a) Define the interference fit and clearance fit. Also, write their applications.
b) A clearance fit has to be provided for a shaft and bearing assembly having a diameter of 40 mm. Tolerances on hole and shaft are 0.006 and 0.004 mm, respectively. The tolerances are disposed of unilaterally. If an allowance of 0.002 mm is provided, find the limits of size for the hole and shaft when (i) hole basis system and (ii) shaft basis system are used.
[5+15 marks]</td><td>20</td><td>CO1</td></tr>
<tr><td>Q 11</td><td>a) Write the working principle of Hot-Wire Anemometry (HWA).
b) What are the applications of hotwire anemometry?
c) A hotwire probe is calibrated inside a wind tunnel at different wind speeds. Plot the calibration curve (on a graph paper), calculate the calibration coefficients of the probe using the calibration data given as follows:
<table><tr><th>Wind speed, U (m/s)</th><th>E (Volt)</th></tr><tr><td>0</td><td>2.6</td></tr><tr><td>0.5</td><td>2.7</td></tr><tr><td>1</td><td>2.78</td></tr><tr><td>2.1</td><td>2.92</td></tr><tr><td>3</td><td>3.01</td></tr><tr><td>4</td><td>3.09</td></tr></table>[5+3+12]
OR
a) What is a Rotameter? Write a short note on its working principle.
b) Derive the expression for the rate of discharge for a venturimeter.
c) What is the coefficient of discharge?
[5+12+3]</td><td>20</td><td>CO3</td></tr>
</table>