B.E. / B.Tech. Instrumentation Engineering (Model Curriculum) Semester-III

IN302M / IN302 - Sensors & Transducers

P. Pages : 2 **GUG/W/24/14010**

Time : Three Hours * 5 5 5 1 * Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Define measurement. Discuss objective of engineering measurement. **8**

b) Define an inverse transducer. Give an example. **8**

OR

2. a) Define Sensors and transducers. Give brief classification of transducers. **8**

b) Describe calibration and its need. **8**

3. a) Write short note on absorption type dynamometer. **8**

b) State the working of torsion bar dynamometer with neat sketch. **8**

OR

4. a) Describe the primary transducers to be used along with strain gauge for the measurement of force. **8**

b) A single strain gauge having resistance of 120Ω is wounded on a steel cantilever beam at a distance of 0.15 m from the free end. An unknown force F applied at the free end produces a deflection of 12.7 mm of the free end. The change of gauge resistance is found to be 0.152Ω. The beam is 0.25 m long with a width of 20 mm and a depth of 3 mm. The Young's modulus for steel is $200\,GN/m^2$. Calculate the gauge factor. **8**

5. a) The output of an LVDT is connected to a 5V voltmeter through an amplifier whose amplification factor is 250. An output of 2 mV appears across the terminals of LVDT when the core moves through a distance of 0.5mm. The milli-voltmeter scale has 100 divisions. The scale can be read to 1/5 of a division. Calculate the sensitivity of LVDT and that of the whole setup.
Also calculate the resolution of the instrument in mm. **8**

b) What is inductance transducer? Mention three principles of inductance transducer. **8**

OR

6.	a)	Describe the parallel plate capacitor transducer for the measurement of linear and angular displacement.	**8**
	b)	State Hall Effect. Draw and discuss the Hall Effect sensor.	**8**
7.	a)	A rotating disc has five equi spaced radial lines marked on it. When a stroboscope is directed at the disc a true pattern is observed at the highest flash frequency equal to 3000 flashes per seconds. What will be the other flash frequencies which produce a 5 line pattern and 10 line patterns?	**8**
	b)	State different types of encoders. Explain with neat sketch any one of them.	**8**

OR

8.	a)	Give the construction and working principle of electromagnetic and photoelectric tachometer.	**8**
	b)	Discuss the seismic type and piezoelectric type instruments for vibration measurement.	**8**
9.	a)	Illustrate the working principle of inductive proximity sensors.	**8**
	b)	Elaborate with a neat sketch Float type densitometer.	**8**

OR

10.	a)	Give the classification of sound sensors and explain any one.	**8**
	b)	Define the terms associated with viscosity.	**8**

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