Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

THIRD SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.)

END SEMESTER EXAMINATIONS, DEC 2016/JAN 2017

SUBJECT: SENSORS AND TRANSDUCERS [ICE 2105]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A.	How would you use a potentiometer to measure level of a fluid in a tank?	**2**
1B.	A semiconductor strain gauge connected in a full bridge configuration. Derive an expression for its sensitivity.	**3**
1C.	Differentiate between robustness and stability of a sensor?	**2**
1D.	With the help of a neat block diagram illustrate the different elements of a generalized measurement system?	**3**
2A.	Explain the operation of an LVDT with a neat diagram.	**3**
2B.	Explain the operation of control synchros with the help of necessary equations.	**3**
2C.	What is thermoelectricity? State the three laws of thermoelectricity?	**2**
2D.	State the relevance of the law of intermediate temperatures in field usage of a thermocouple?	**2**
3A.	How can a capacitive transducer be used for measurement of paper thickness?	**2**
3B.	In order to measure strain in a cantilever beam, a single strain gauge of resistance 1 K and gauge factor 2 is mounted on the beam and connected in one arm of a bridge circuit. The other three arms of the bridge have a resistance of 1000 ohm each. The bridge detector resistance is 100 ohm and its sensitivity is 10mm/μA and an input voltage of 10V. Calculate detector deflection for 0.1 % strain.	**3**
3C.	Compare the three wire and four wire connections of a strain gauge with the help of necessary expressions.	**3**
3D.	What is hall effect? What are the possible physical parameters which can be transduced by a hall effect sensor	**2**
4A.	How are incremental encoders made direction sensitive? Explain with a schematic.	**3**
4B.	In elevator applications, Spring Loaded LVDT position sensors measure the spring deflection as a result of the load. The sensors' springs compress as an elevator is loaded with passengers to ensure that both cars and building floors properly align for each floor. Depending upon the elevator manufacturer, sensors are mounted either under or above the elevator car. Also, it slows down the elevator when it reaches the desired floor before it stops. How does it work? Explain with a schematic?	**3**
4C.	In Nagpur Railway station, a door mat is used to light up lamps. As people walk over	**2**

it, some kind of energy is produced. How do you think this works?

5A.	Write a short note on Photodiode and Phototransistor	**3**
5B.	Explain with a neat schematic the concept of mass spectroscopy. Why is it used?	**3**
5C.	Write down the fabrication procedure of a micro Inter Digital Electrode of gold.	**4**

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