Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

THIRD SEMESTER B.TECH (INSTRUMENTATION & CONTROL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

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. Represents the dimensions for the following mechanical quantities. **3**
1. Velocity 2. Acceleration 3. Force 4. Work 5. Surface Tension

1B. List the SI units. **3**

1C. Describe the high gain feedback method for correcting the interfering and modifying inputs. **4**

2A. Describe the methods to achieve temperature compensation in strain gauge. **6**

2B. A resistance, wire strain gauge with a gauge factor of 2 is bonded to a steel structural member subjected to a stress of 100 MN/M^2. The modulus of elasticity of steel is 200 GN/m^2. Calculate the percentage change in the value of the gauge resistance due to the applied stress. **2**

2C. A resistance wire strain gauge uses a soft iron wire of small diameter. The gauge factor is +4.2. Neglecting the piezoresistive effects, calculate the Poisson's ratio. **2**

3A. Explain thermo electric laws of thermocouple with necessary diagrams. **4**

3B. A pressure measuring instrument uses a capacitive transducer having a spacing of 4 mm between its diaphragms. A pressure of 600 kN/m^2 produces an average deflection of 0.3 mm of the diaphragm of the transducer. The transducer which has a capacitance of 300 pF before application of pressure and is connected in an oscillator circuit having a frequency of 100 kHz. Determine the change in frequency of the oscillator after the pressure is applied to the transducer **3**

3C. On which three principles do the variable inductance transducers work? Explain briefly each one of them. **3**

4A. How magneto-strictive transducers can be used for generation of ultrasound? **3**

4B. A piezoelectric crystal having dimensions of 5mm x 5mm x 1.5 mm and a voltage sensitivity of 0.055 V – m/N is used for force measurement. Calculate the force if the voltage developed is 100 V. **3**

4C. Explain the working of pH measuring electrodes with neat diagram. **4**

5A.	Explain the working of vacuum type photo emissive tubes with neat diagram.	**3**
5B.	Describe photo diode and its characteristics with neat diagram.	**4**
5C.	Into which three categories are the encoders classified. Explain each of them.	**3**