Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

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

END SEMESTER EXAMINATIONS, DEC 2016/JAN 2017

SUBJECT: INSTRUMENTATION SYSTEM DESIGN (ICE 429)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.

1A.	Explain different coupling mechanisms which can cause noise in a measurement system. Discuss any two techniques for reducing measurement noise.	**5**
1B.	What is the effect of internal resistance in causing loading effect when a measurement system acts as a voltage source.	**3**
1C.	If E_{TH}=1V and V_{SM}= 0.1V are the RMS values of Thevenin Equivalent and Noise Voltage respectively of a measurement device, then what is the Signal to noise ratio (in dB) of the instrument.	**2**
2A.	A output of sensor varies in the range from -2.4V to -1.1V. For interfacing it with an ADC, this needs to be converted to 0 to 2.5 V. Develop the required signal conditioning.	**5**
2B.	Write any two considerations to be taken for designing a resistive wheatstone bridge circuit when using it for different measurement systems	**3**
2C.	Discuss the advantage of three wire RTD over two wire RTD.	**2**
3A.	Derive the thevenin equivalent model of a potentiometer displacement sensor and obtain the expression for nonlinearity with respect to displacement.	**5**
3B.	Briefly discuss the advantages of capacitive based level measurement systems	**3**
3C.	What are the differences between long form venturi tube and short form venturi tubes?	**2**
4A.	Using diagrams, explain about hydraulic, inductive and magnetostrictive types of load cells.	**5**
4B.	Discuss about any two installation effects that can cause swirls in fluid flows. How can swirls be avoided?	**3**
4C.	What are the considerations to be taken care when connecting multiple receivers to a	**2**

2-wire transmission loop.

5A.	Using suitable diagrams, discuss how 2-wire transmitters differ from 3-wire transmitters. Discuss one case where using 2-wire transmitter is better than 3-wire.	**5**
5B.	Briefly describe the procedure of control room design.	**3**
5C.	With neat labels, and indicating different sections, draw the block diagram of a smart transmitter.	**2**
6A	Develop a microcontroller based system for the measurement of blood pressure. Further, use an LCD module to display the data of systolic and diastolic blood pressure separately. (i)Discuss about the hardware required for developing the system. (ii)Develop a suitable block diagram for the hardware implementation and a flow chart for the software implementation of the system.	**5**
6B	Differentiate between different conventional annunciator operating sequences.	**3**
6C	Write any two features of process flow diagram and loop diagram in an instrument document.	**2**

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