Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

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

END SEMESTER EXAMINATIONS, NOV/DEC 2016

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.	Using suitable circuits and equations explain how external noise affects a voltage transmission system and a current transmission system. Also show that a current transmission system has better noise rejection.	**5**
1B.	Fig.Q.1B shows a differential pressure transmitter connected as a current source for measuring pressure of the range 0 - $2x10^4$ Pa. Obtain the relative error in measurement at the true value of pressure is $1.3x10^4$ Pa.	**3**
1C.	A thermometer with a time constant of 3.5s is quickly taken from a temperature of 0^oC to a water bath having temperature of 100^oC. What temperature will it indicate after 1.5s.	**2**
2A.	Temperature is to be measured in the range of 250 to 450^oC. The sensor is a resistance that varies linearly from 280 to 1060Ω for this temperature range. Power dissipated in the sensor must be kept below 5mW. Develop analog signal conditioning circuit that provides a voltage varying linearly from -5V to +5V for this temperature range. The load is a high-impedance recorder.	**5**
2B.	Fig.Q.2B shows a deflection bridge which can be used for level measurement with respect to change in capacitance (C_h).Obtain the thevenin equivalent of the circuit and a linear relationship between E_{Th} and C_h.	**3**
2C.	A measurement signal has a frequency <1kHz, but there is unwanted noise at about 1 MHz. Design a low-pass filter that attenuates the noise to 1%	**2**
3A.	Using required circuits and equations, discuss different cold junction compensation techniques for thermocouple.	**5**
3B.	A potentiometer acting as a displacement measuring device shown in Fig. Q.3B is a first order measurement system. Justify the statement.	**3**
3C.	A strain gauge has a nominal resistance of 600Ω and a gauge factor of 2.5.The strain gauge is connected in a DC bridge with three other resistances of 600Ω each. The bridge is excited by a battery of 4V.If strain gauge is subjected to a strain of 100μm/m what will be the bridge output?	**2**
4A.	Discuss about different types of orifice plates, their sizing requirements and selection criteria's.	**5**
4B.	How triangulation method can be used for level measurements? What are its applications?	**3**
4C.	How a Y Coupler can be used for a reflective type fiber optic sensor?	**2**
5A.	What are the different elements in a 2-wire transmitter loop and the considerations for choosing them.	**5**
5B.	With one each peculiar characteristic, differentiate various control panel layouts.	**3**

5C. Briefly describe the two calibrations to be done for Smart transmitters. **2**

6A. A microcontroller based system is to be used for monitoring vehicle speed on highways. The system should measure the vehicle speed and if the vehicle speed is more than 80km/hr the image of the vehicle number should be captured and stored in a database for sending notification to the owner at a later stage. **5**

(i) Discuss the hardware requirements 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.

6B. Describe the significance of the different parts of an Instrument Tag Number with the help of an example. **3**

6C. How does a remote annunciator differ from an integral annunciator? **2**

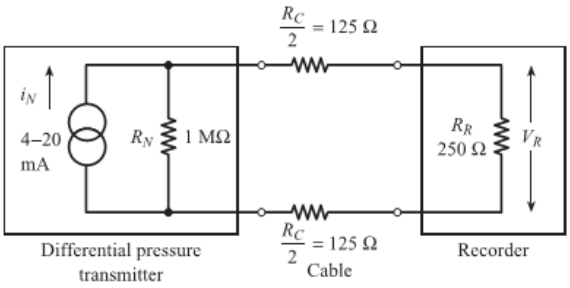

Fig.Q.1B

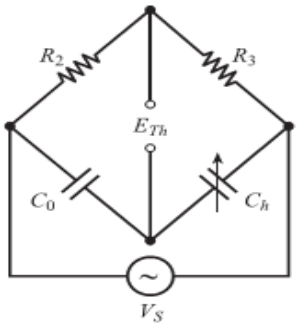

Fig.Q.2B

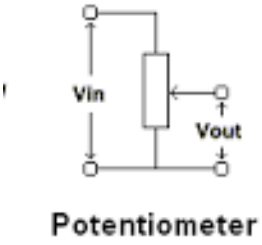

Fig.Q.3B

********** END **********