Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

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

END SEMESTER EXAMINATIONS, JUNE 2017

SUBJECT: INSTRUMENTATION SYSTEM DESIGN [ICE 4007]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. **Fig.Q.1A** shows a pH measurement system. Obtain the percentage error in measurement output due to loading at different stages of the measurement. **4**

1B. Discuss any two causes of measurement noise and reduction techniques. **4**

1C. A potentiometer acting as a displacement measuring device shown in **Fig.Q1B** is a first order measurement system. Justify the statement. **2**

2A. Explain the considerations to be taken for specifying the parameters of a resistive deflection bridge for a measurement system. **4**

2B. Signal-conditioning analysis shows that the following equation must relate output voltage to input voltage: $\mathbf{V_{out} = 3.35V_{in} - 2.68}$ **4**
Design a circuit to do this using a summing amplifier

2C. Discuss about the importance of dummy gauge when using a strain gauge for force measurement. **2**

3A. A type K thermocouple with a 24^{o}C reference produces a voltage of 35.56mV. What will be the temperature? **4**
Given in **Table.Q3A: Thermocouple** table for 0^{o}C compensated K type thermocouple.

3B. Describe any four advantage of current transmission over voltage transmission. **4**

3C. Discuss about the considerations to be taken care of when multiple data acquisition devices are connected to a current transmission loop. **2**

4A. Explain the major differences between short form Venturi tubes and Classic venturi tubes. **4**

4B. With the help of a block diagram explain the major sections and components of a Smart transmitter. **4**

4C. **Fig.Q4C** shows the piping requirements for various connections of a Venturi tube in a flow stream. Interpret different piping considerations to be taken care from the graph for different diameter ratios of the pipe. **2**

5A. Develop a micro controller based medical device for measuring the vision of eye and recording the vision as a digital value. **5**
(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.

5B. Discuss about any three features of a control room. **3**

5C. Using an example discuss the importance of Instrument Tag Number. **2**

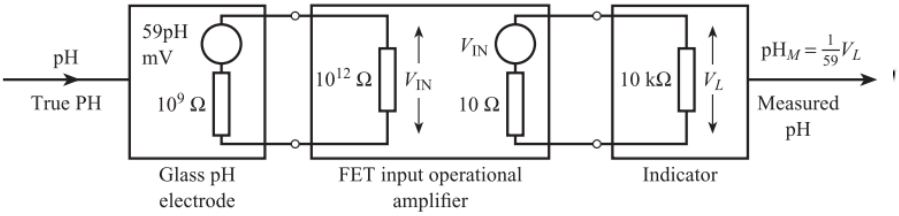

Fig.Q1A

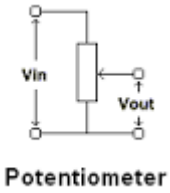

Fig.Q1B

°C	0	1	2	3	4	5	6	7	8	9	10
0	.000	.039	.079	.119	.158	.198	.238	.277	.317	.357	.397
10	.397	.437	.477	.517	.557	.597	.637	.677	.718	.758	.798
20	.798	.838	.879	.919	.960	1.000	1.041	1.081	1.122	1.162	1.203
30	1.203	1.244	1.285	1.325	1.366	1.407	1.448	1.489	1.529	1.570	1.611
40	1.611	1.652	1.693	1.734	1.776	1.817	1.858	1.899	1.940	1.981	2.022
50	2.022	2.064	2.105	2.146	2.188	2.229	2.270	2.312	2.353	2.394	2.436
60	2.436	2.477	2.519	2.560	2.601	2.643	2.684	2.726	2.767	2.809	2.850
70	2.850	2.892	2.933	2.975	3.016	3.058	3.100	3.141	3.183	3.224	3.266
80	3.266	3.307	3.349	3.390	3.432	3.473	3.515	3.556	3.598	3.639	3.681
90	3.681	3.722	3.764	3.805	3.847	3.888	3.930	3.971	4.012	4.054	4.095
100	4.095	4.137	4.178	4.219	4.261	4.302	4.343	4.384	4.426	4.467	4.508
110	4.508	4.549	4.590	4.632	4.673	4.714	4.755	4.796	4.837	4.878	4.919
120	4.919	4.960	5.001	5.042	5.083	5.124	5.164	5.205	5.246	5.287	5.327
130	5.327	5.368	5.409	5.450	5.490	5.531	5.571	5.612	5.652	5.693	5.733
140	5.733	5.774	5.814	5.855	5.895	5.936	5.976	6.016	6.057	6.097	6.137
150	6.137	6.177	6.218	6.258	6.298	6.338	6.378	6.419	6.459	6.499	6.539
160	6.539	6.579	6.619	6.659	6.699	6.739	6.779	6.819	6.859	6.899	6.939
170	6.939	6.979	7.019	7.059	7.099	7.139	7.179	7.219	7.259	7.299	7.338
180	7.338	7.378	7.418	7.458	7.498	7.538	7.578	7.618	7.658	7.697	7.737
190	7.737	7.777	7.817	7.857	7.897	7.937	7.977	8.017	8.057	8.097	8.137

Table.Q3A

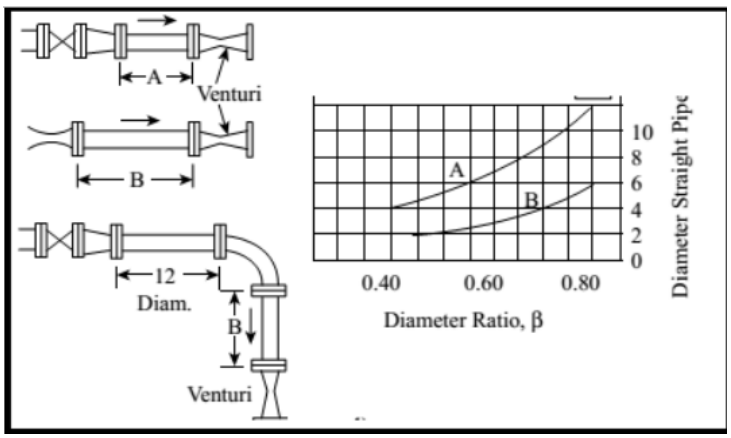

Fig.Q4C