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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)

V Semester B. E. Examinations Nov/Dec-19

Electronics and Communication Engineering

TRANSDUCERS AND DATA ACQUISITION SYSTEMS (ELECTIVE)

Time: 03 Hours ***Maximum Marks: 100***

Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6

PART-A

1	1.1	Mention the different signal conditioning stages in a typical sensing system.	02
	1.2	List the common problems that occur during the interfacing of sensor and a signal conditioning circuit.	02
	1.3	Mention the expression for Bell type manometer wall position during upward and downward forces.	02
	1.4	Define throttling range for a typical flapper nozzle displacement transducer metal.	02
	1.5	Mention commonly used wire bound metal elements for resistance thermometers.	02
	1.6	Mention the Reynolds numbers for laminar and turbulent flow.	02
	1.7	List the different modes of piezoelectric effect.	02
	1.8	What are the basic functions in signal conditioning circuit?	02
	1.9	Mention the types of measurement for a signal conditioning equipment in a DAQ board.	02
	1.10	List out different system isolation techniques in signal processing circuit.	02

PART-B

2	a	Briefly explain the components of a general measurement system.	06
	b	Explain with an example, linear position sensing with its drawbacks.	06
	c	A strain gauge with nominal resistance $R = 120\Omega$ is installed in a branch of a Wheatstone bridge having for unstrained strain gauge $R1 = R2 = R3 = R4 = R$ and Vi of $10V$. As a result of bending the beam, on which it is cemented, the strain gauge is subject to a strain. A digital voltmeter with input resistance R_m of $10M\Omega$ gives a reading of $Vo = 5mV$. i) Determine the change in resistance ΔR ii) The strain ϵ for gauge factor $G = 2$.	04
3	a	Describe the working of a seismic displacement sensor in detail.	06
	b	Explain the working of Bimetallic elements in detail.	10
		OR	

4	a	Write brief note on Thin film Diaphragms with load effect and upload effect.	08
	b	Explain the typical flapper nozzle type displacement transducer with appropriate expressions in detail.	08
5	a	Explain in detail about proximity sensor using a capacitive transducer with neat diagram.	08
	b	Briefly explain the concept of reluctance in an inductive transducer and Solenoid coil with plunger core displacement.	04
	c	A capacitive transducer uses two quartz diaphragms of area $750mm^2$ separated by a distance of $3.5mm$. A pressure of $900kN/m^2$ when applied to the top diaphragm produces a deflection of $0.6mm$. The capacitance is $370pF$ when no pressure is applied to the diaphragms. Find the value of capacitance(approx..) after the application of pressure of $900kN/m^2$.	04
		OR	
6	a	Explain in detail about methods of Capacitive thickness transducer with expressions.	10
	b	Explain the following phenomenon in thermocouple system: i) Seeback effect ii) Peltier effect iii) Thompson effect.	06
7	a	Explain in detail the thermocouple probes for surface temperature measurements using two metals and three metals with neat diagrams.	08
	b	Briefly explain about Piezoelectric phenomena with neat diagram.	08
8	a	Examine how the grounded and floating sources can be connected with single ended and differential ended measurement.	08
	b	List out different noise and interfaces in signal processing circuits and also explain the different techniques to isolate the noises and interference.	08