Reg. No.:

Name :

VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

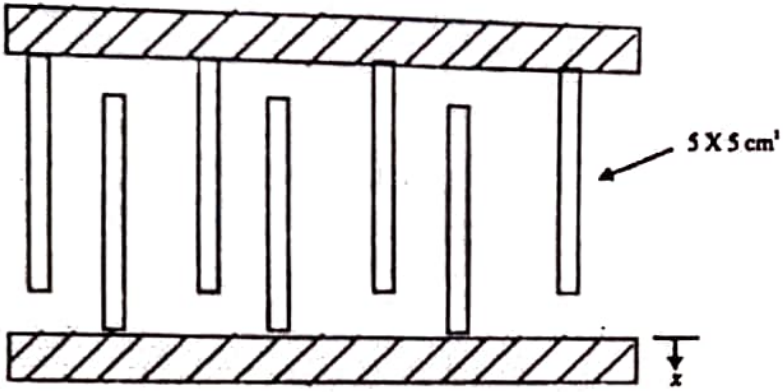
Continuous Assessment Test II – March 2023

Programme	:	B. Tech (CSE-AIR)	Semester	:	WS 2022-23
Course	:	SENSORS, ACTUATORS AND SIGNAL CONDITIONING	Code	:	BCSE420L
			Class Nbr	:	CH2022235001321 CH2022235001315 CH2022235001320 CH2022235001316 CH2022235001322
Faculty	:	Dr.Ranjeet Kumar, Dr. Kiruthika V, Dr. Sheena Christabel Pravin, Dr. P. Nirmala ,Dr.Biswajit Jena	Slot	:	C2
Time	:	90 Minutes	Max. Marks	:	50

Answer <u>ALL</u> the questions

Q. No.	Sub. Sec.	Questions	Marks
1.		A gear manufacturing company received an order from a car manufacturer to deliver a variety of gears for building the car engine. List and illustrate the different gears they would deliver to facilitate car engine construction. **[6 marks]**. One such compound gear train had a *driver gear* with 60 meshing teeth and *driven gear* with 30 meshing teeth. Work out the velocity ratio of the gear train while the driven gear to know the ultimate torque rendered by the compound gear train **[4 marks]**.	10
2.		A process Engineer is asked to choose between a pneumatically actuated valve or an electrically actuated valve for a process system in a scenario where explosive gas/vapor is anticipated. Which style of actuation would be the best choice? Substantiate the reason for the choice. **[2 marks]** Also, list the actuators by name, and characteristics mentioning their pros and cons. **[5 marks]**. Give a brief distinction between pneumatic and electrical actuators. **[3 marks]**	10
3.		An industry requires the structural component of a designed equipment to test for its elongation or compression. Suggest a transducer to measure it. Explain its construction and operation with relevant equations and diagram.	10
4.	i	A LVDT has an output of 6V when the displacement is 0.4×10^{-3} m. Determine the sensitivity of this instrument in volt/mm. A 10 volt voltmeter with 100 scale divisions is used to read the output. Two tenths of a division can be estimated with ease. Determine the resolution of the LVDT in mm.	6
	ii	A displacement measuring system consists of 7 parallel plates arranged as shown in below figure. Each plate is of area 5 cm x 5 cm and the gap between	4

the plate is 0.25mm. Calculate the capacitance when the overlapping distance is 4 cm. The permittivity of air is 8.85×10^{-12} f/m.



A first-order active low-pass filter is designed to have a cut-off frequency of 1 KHz. If the value of the capacitance used is 1 nF, find the value of R. Draw the resulting circuit of the active low-pass filter. **[5 marks].**

5. If the filter is extended to an order of 3, find the roll-off rate **[2 marks]**. 10

Further, when this low-pass filter is cascaded with a high-pass filter with a cut-off frequency of 750 Hz, what will be the resultant system of filter function? **[3 marks]**

Course Faculty

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