BACHELOR OF ELECTRICAL ENGINEERING (EVE) (3rd YR 1ST SEMESTER) EXAMINATION, 2017

(1st / 2nd-Semester/~~Repeat~~/Supplementary/~~Annual~~/~~Bi-Annual~~)

SUBJECT: - ELECTRICAL INSTRUMENTATION

Full Marks 100

Time: ~~Two hours~~/Three hours/ ~~Four hours~~/ ~~Six hours~~ (50 marks for each part)

Use a separate Answer-Script for each part

No. of Questions	PART I	Marks
	Answer Question: **ONE** and any **TWO** from the rest: (All symbols have their usual significance.)	
1.	***Answer any four questions.***	
	a) Why PSD circuit connected to LVDT sensor can detect the direction of displacement ?	
	b) Why variable dielectric type capacitive sensor is suitable for measurement of thickness?	
	c) Why temperature compensation is needed for strain gauge bridge	
	d) How a piezoelectric sensor can be used in accelerometer ?	
	e) Distinguish between the operation of Doppler frequency shift type and Transit type ultrasonic flow sensor	4X5
2.		
	f) Derive the expression of frequency domain transfer function and voltage sensitivity per unit core displacement of a LVDT when its secondary is connected is connected to meter load.	
	g) The core of a LVDT is connected to a diaphragm type pressure sensor. The LVDT gives output of 10V rms when the pressure is 200N/m^2 .The diaphragm is deflected through 0.5X10^{-3} mm by a pressure of 100 N/m^2. What is the sensitivity in V/N/$m^2$of the whole arrangement?	8+7
3.		
	a) Define 'g 'and 'd' constants of a piezoelectric sensor . Prove any relation existing between them.	
	b) Derive the expression of error voltage as output from a AC bridge , whose adjacent arms include two capacitive elements (C1,C2) of a differential capacitive sensor and change by $\pm\Delta C$	7+8

7 Ref No: EE/5/T/311/2017(S)

BACHELOR OF ELECTRICAL ENGINEERING (EVE) (3RD YR 1ST SEMESTER) EXAMINATION, 2017

(1st / 2nd-Semester/~~Repeat~~/Supplementary/~~Annual~~/~~Bi-Annual~~)

SUBJECT: - ELECTRICAL INSTRUMENTATION

Full Marks 100

Time: ~~Two hours~~/Three hours/ ~~Four hours~~/ ~~Six hours~~ (50 marks for each part)

4.	a) Explain the phenomenon of piezoelectricity with necessary diagram. b) What are the different modes .of piezoelectric sensors? c) Explain with diagram, the working principle of servo accelerometer .	5+5+5
	Write short notes on any three of the following:	
5.	a) Liquid level measurement using ultrasonic sensors following pulse echo method. b) Electromagnetic type velocity sensor. c) Hot wire anemometer . d) Load cell.	3X5

Ref No: EX/EE/5/T/311/2017(S)

B.E.E. (EVENING) 3RD YEAR 1ST SEMESTER SUPPLEMENTARY EXAMINATION, 2017

SUBJECT: - ELECTRICAL INSTRUMENTATION

Time: Three hours **Full Marks 100**
(50 marks for each part)

Use a separate Answer-Script for each part

No. of Questions	PART-II	Marks
	Answer any three, 2 marks for well organized answers	
1.	**Justify and/or correct the following statements:**	**(4X4=16)**
i)	Switched capacitor circuits have certain advantages in IC technology.	
ii)	Butterworth poles are placed on an ellipse.	
iii)	*Lock Range* and *Capture Range* of a Phase Locked Loop (PLL) are same.	
iv)	State variable filters are called ***"universal filters".***	
2. a)	Design a low pass maximally flat active filter with the following specifications: a) 3 dB cut-off frequency (ω_c) = 1000 rad/s. b) maximum attenuation in the pass band is 0.5 dB for $\omega \leq 0.5\omega_c$ rad/s. c) minimum attenuation in the stop band is 20 dB for $\omega \geq 4\ \omega_c$ rad/s d) pass band gain = 4 Realize the above filter circuit.	(9+7=16)
b)	Derive the transfer function of a high pass filter for state variable filters. (Draw necessary circuit realization).	
3. a)	How PLL can be used as frequency translator?	(6+6+4= 16)
b)	Develop a linear model of PLL.	
c)	How proper compensation circuit is designed for Cathode Ray Oscilloscope (CRO) to avoid error due to input impedance?	
4. a)	Explain the operation of a successive approximation type A/D converter for 3-bits.	(6+6+4=16)
b)	A four bit unipolar Successive Approximation type ADC has an offset error of - ½ LSB. Reference voltage is +12 volts. Find the output for input voltage 8.6 V <u>with</u> and <u>without</u> offset error.	
c)	Compare the conversion times for 4 bit SAR type and counter type ADC in case of 8.6 V input with V_{ref} = +12 V and clock frequency 1kHz.	
5.	Write Short notes on any ***two***	(2X8=16)
a)	Storage Oscilloscope	
b)	Gain and offset errors of DAC	
c)	Linearity error of ADC	