



S J P N Trust's

Hirasugar Institute of Technology, Nidasoshi.

Inculcating Values, Promoting Prosperity

Approved by AICTE, Recognized by Govt. of Karnataka and Affiliated to VTU Belagavi

E&E Engg. Dept.

Exam

Internal Assessment

Even Sem(2017-18)

Sem: VI

Date: 20/05/2018

THIRD INTERNAL ASSESSMENT

Sub: Sensors and Transducers

Time: 3PM-4PM

Sub. Code: ISEE662

Max. Marks: 25

Note: Answer two full questions, draw sketches wherever necessary.

Discription of Question

Q. No		Marks	CO	RBT LEVEL
1	a Explain briefly the functions of signal conditioning equipment.	5	324.2	L2
	b Explain the working of buffer amplifier and differential amplifiers in brief.	7	324.2	L2
2	a Explain the working of multichannel analog multiplexed data acquisition system with block diagram.	5	324.3	L2
	b Explain briefly the working of successive approximation A/D converter and flash A/D converter.	7	324.3	L2
3	a Explain briefly the working of hydraulic and pneumatic data transmission with neat diagrams.	6	324.4	L2
	b What is telemetry? Explain the working of voltage telemetering system in brief.	7	324.4	L2
4	a Explain the working of motion balance and force balance current telemetering systems.	6	324.4	L2
	b What is modulation? Explain briefly amplitude and frequency modulation.	7	324.4	L2

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SCHEME OF EVALUATION

Subject: Sensors & Transducers

Sub Code: 15EE662

Date: 20/05/2018

Marks CO's

Description

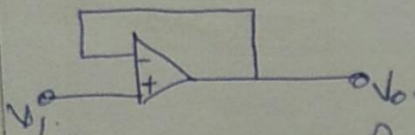
a) Functions of signal conditioning.

- i) Amplification.
- ii) Modification or modulation
- iii) Impedance matching
- iv) Data processing.
- v) Data transmission.

5m x 8m

5D324-2

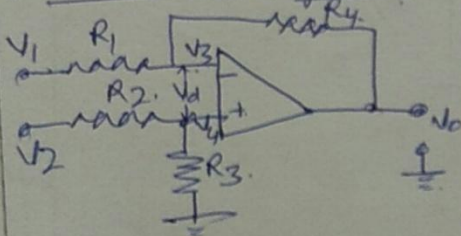
b) Buffer Amplifier.



→ 3m

7m324-2

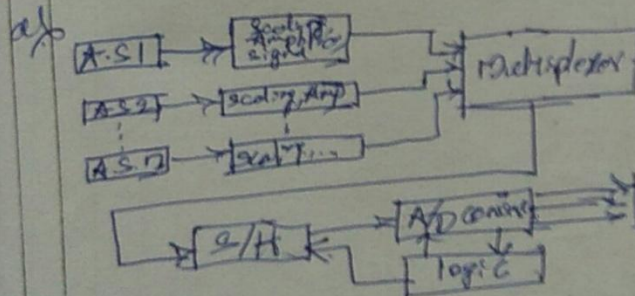
Differential Amplifier.



$$V_o = G_d(V_+ - V_-)$$

$$G_d = \frac{V_o}{V_+ - V_-} = \frac{V_o}{V_1 - V_2}$$

$$CMRR = 20 \log_{10} \left(\frac{G_d}{G_{cm}} \right) \text{dB}$$



→ 2m

5m324-3

Explanation → 3m



SCHEME OF EVALUATION

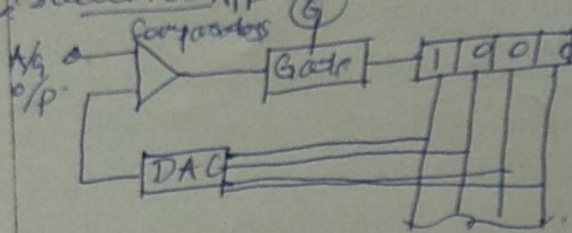
Sub Code: 15EE662

Date: 20/06/2018

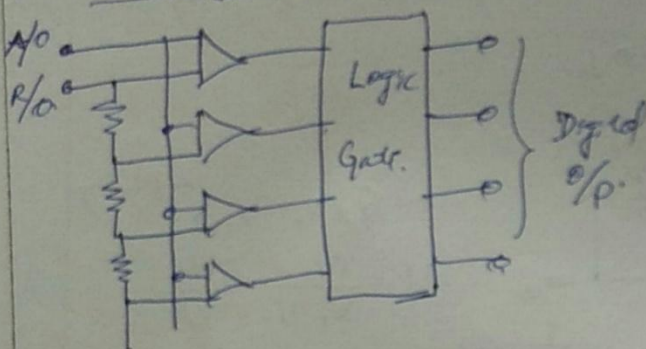
Marks: 100

Sem: VI	Subject: SST	Description	
Q. No.	Bit		

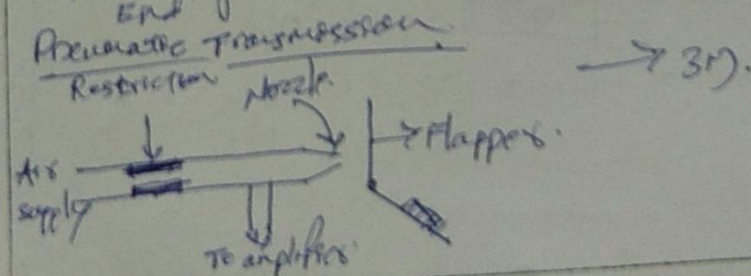
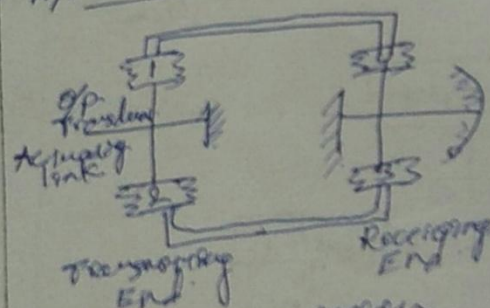
2. a) Successive Approx. A/D converter. → 4M



i) Flash A/D converter. → 3M



3. a) Hydraulic Transmission. → 3M



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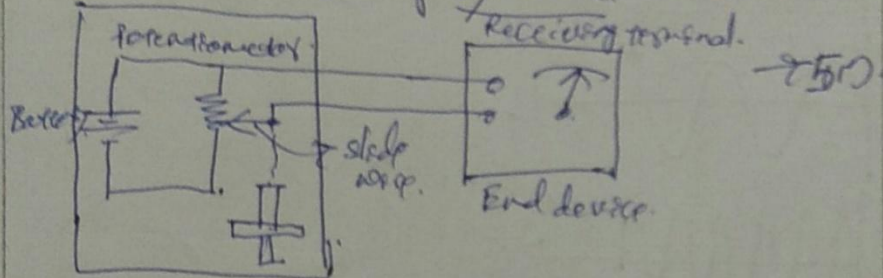
HOD



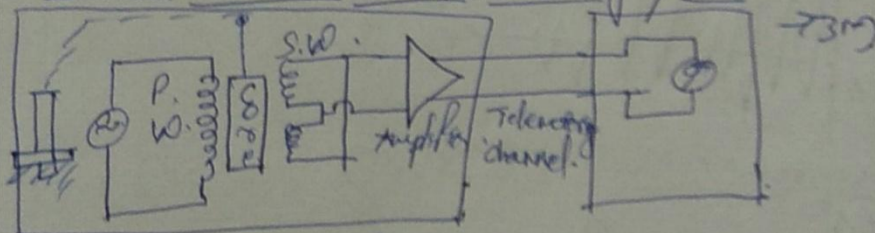
Sl. No.	Subject : SST	SCHEME OF EVALUATION	Sub Code : HSEEE62 Date : 20/5/2018
Q. No.	Q. No.	Description	Marks/CO's

b) Telemetry: A technology which allows users to collect information from inaccessible & inconvenient locations & to transmit it to the accessible places to process, record & display the information in presentable form. → 2M

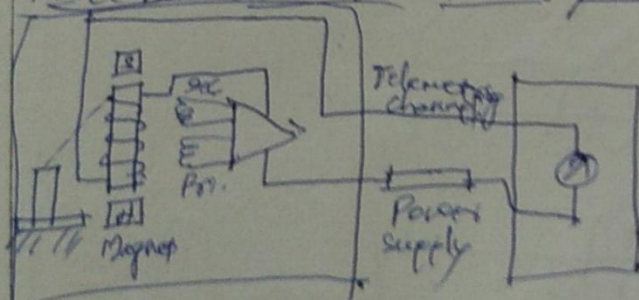
or
Voltage Telemetry system



a) Weight Balance C_W telemetry system



Force Balance C_F telemetry system





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SCHEME OF EVALUATION

Sem : IV
Q. No. Bit

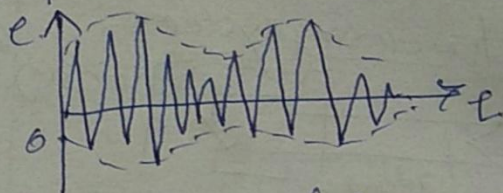
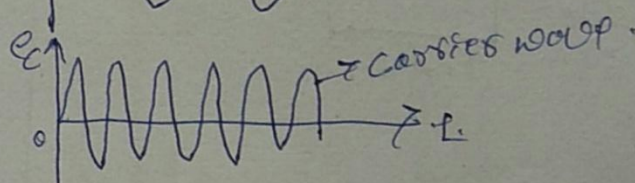
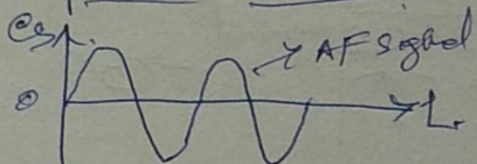
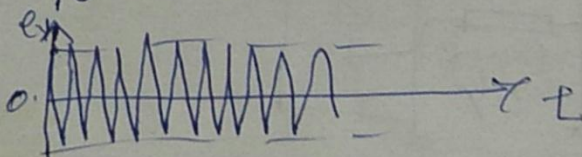
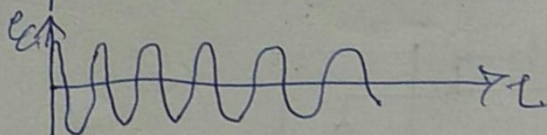
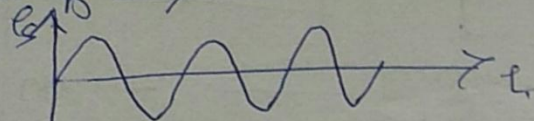
Subject : SST

Sub Code : ISEE662

Date : 20

Description

4. b) Modulation is the process of combining the low frequency signal with a very high frequency radio wave called carrier wave (CW). The resultant wave is called modulated carrier wave. $\rightarrow 1M$

Amplitude Modulation (AM). $\rightarrow 3M$ Frequency Modulation (FM) $\rightarrow 3M$ 



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Exam

Internal Assessment

Even Sem(2017-18)

Sem: VI

Date: 13/04/2018

SECOND INTERNAL ASSESSMENT

Sub: Sensors and Transducers

Time: 3PM-4PM

Sub. Code: 15EE662

Max. Marks: 25

Note: Answer two full questions, draw sketches wherever necessary.

No	Discription of Question	Marks	CO	RBT LEVEL
a	Explain the working of bonded and unbonded resistance wire strain gauge.	6	324.1	L2
b	Explain the gauge factor of strain gauge and hence, derive an expression for gauge factor.	7	324.1	L2
OR				
a	Explain the construction and working of strain gauge load cells with suitable equations.	7	324.1	L2
b	Explain the working of different types of proximity sensors.	6	324.1	L2
a	What are optical fiber sensors? Explain the working of extrinsic and intrinsic type fiber optic sensors.	6	324.1	L2
b	Explain the working of electromagnetic and opto-electrical frequency domain digital transducers.	6	324.1	L2
OR				
a	Explain the working of synchros and resolvers with neat diagrams.	6	324.1	L2
b	Explain the working of MEMS accelerometer and humidity microsensors.	6	324.1	L2

Course Coordinator

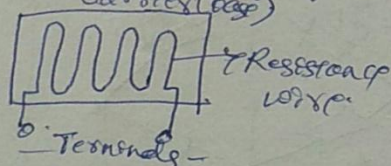
Module Coordinator

HOD



Subject: SST		SCHEME OF EVALUATION		Date: 13/04/2018	
No.	Bit	Description	Sub Code: ICEE662	Marks	CO's

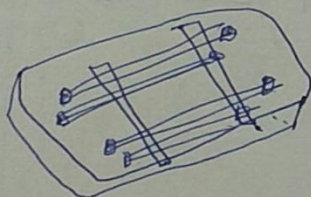
1. a. Bonded strain gauge.
 Carrier (base)



→ 3M

6M 3241.

Unbonded strain gauge



→ 3M

b. Gauge Factor: The ratio of per unit change in resistance to per unit change in length.

→ 2M

7M 3241.

$$GF = \frac{\Delta R/R}{\Delta L/L} \quad \& \quad R = \frac{\rho L}{A D^2}$$

$$dR = \frac{1}{K D^2} \left[(\rho \cdot dL + L \cdot d\rho) - \rho L \cdot \frac{dD}{D} \right]$$

$$\frac{dR}{R} = \frac{dL}{L} + \frac{d\rho}{\rho} - 2 \frac{dD}{D}$$

$$\frac{\Delta R}{R} = GF \cdot \frac{\Delta L}{L} = GF \times \epsilon$$

$$GF = 1 + 2\mu + \frac{\Delta \rho / \rho}{\epsilon} = 1 + 2\mu + \frac{\Delta \rho / \rho}{\Delta L / L} \quad \rightarrow 5M$$

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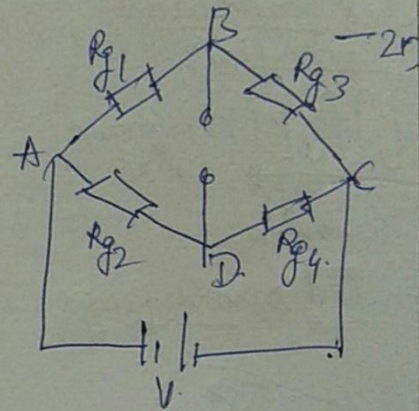
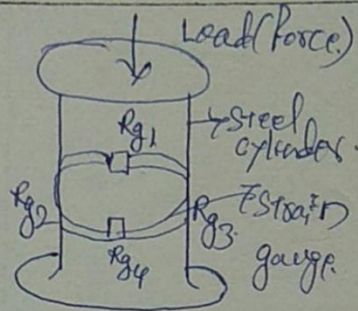
Page No.: 2/4

SCHEME OF EVALUATION

Sem: IV Subject: 287 Sub Code: 1SEE662 Date: 13/4/18

Q. No. Bit Description Marks CO's

2. a/b



$$V_{AB} = V_{AD} = \frac{V}{2}$$

$$V_{AD} - V_{AB} = V_0 = 0$$

$$R_{g1} = R_{g4} = R - dR$$

$$R_{g2} = R_{g3} = R + dR$$

$$V_{AB} = \frac{R - dR}{2R - dR(1 - \mu)} \times V$$

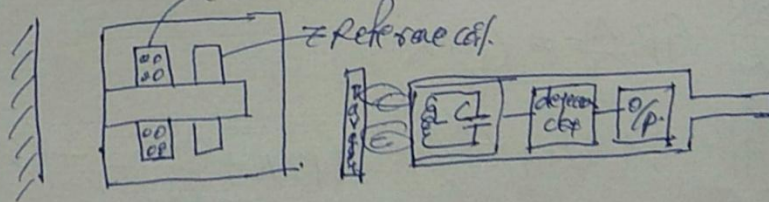
$$V_{AD} = \frac{R + dR}{2R - dR(1 - \mu)} \times V$$

$$V_0 + dV_0 = 2(1 + \mu) \left(\frac{dR}{R} \cdot \frac{V}{4} \right)$$

$$dV_0 = 2(1 + \mu) \left(\frac{dR}{R} \cdot \frac{V}{4} \right)$$

— 5M.

b/p i) Eddy C = proximity sensors.



— 2M

6M

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HOD Co

Subject: SST

SCHEME OF EVALUATION

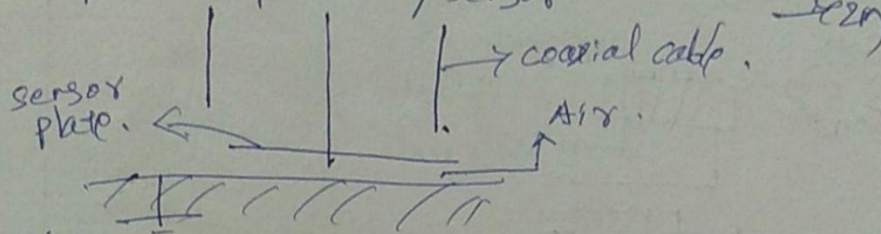
Sub Code: ISFE 662

Date: 13/4/18

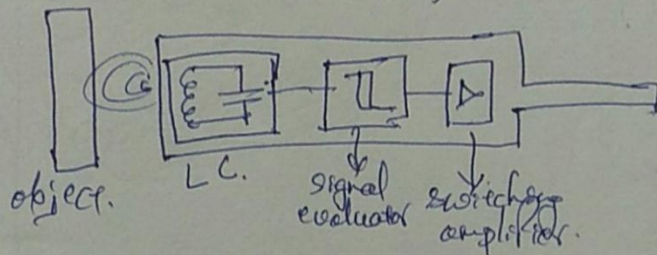
Description

Marks CO's

ii) Capacitance proximity sensor.

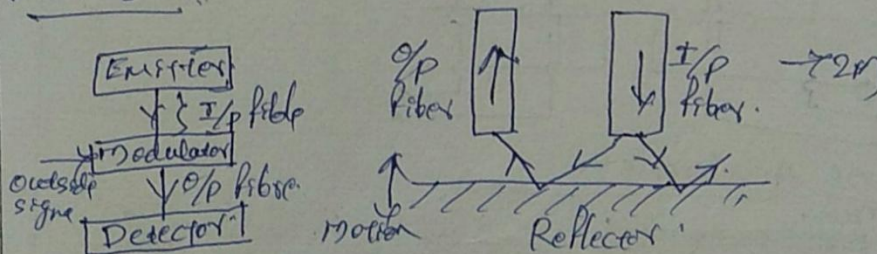


iii) Inductive proximity sensor.

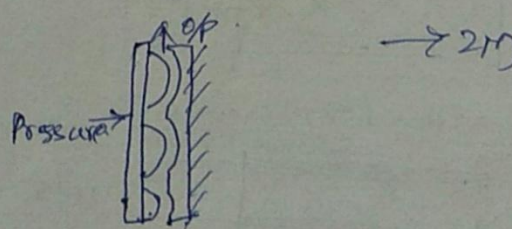
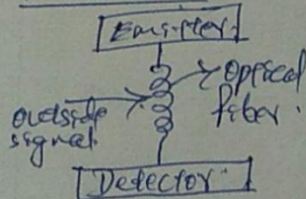


Q. OFS work on the principle of attenuation of light by external variables.

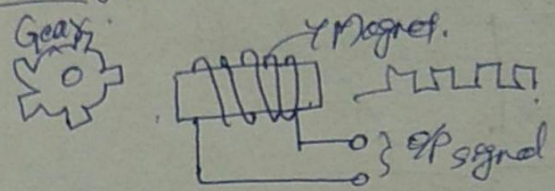
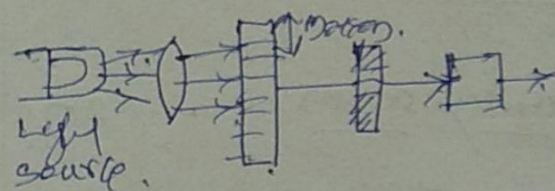
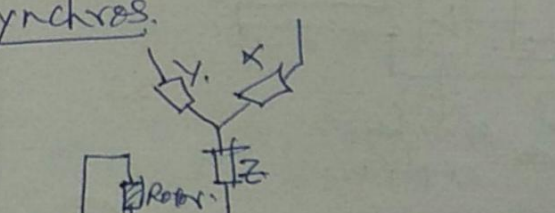
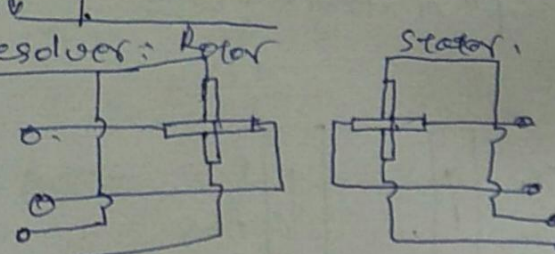
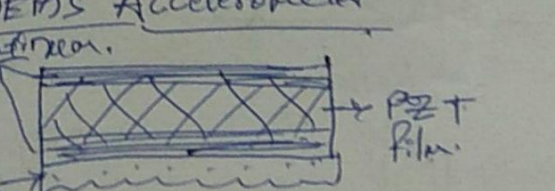
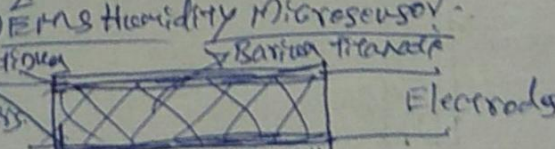
Extrinsic:



Intrinsic:



SCHEME OF EVALUATION		
Subject: <u>SST</u>	Sub Code: <u>ISEE662</u>	Date: <u>13/4/18</u>
Description	Marks	CO's

<u>Inductive magnet</u>  → 3M	6M	3M
<u>Optical sensor</u>  → 3M	6M	3M
<u>Synchros</u>  → 3M	6M	3M
<u>Resolver: Rotor</u>  → 3M	6M	3M
<u>MEMS Accelerometer</u>  → 3M	6M	3M
<u>MEMS Humidity Microsensor</u>  → 3M	6M	3M



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Internal Assessment
Even Sem(2017-18)

Sem: VI
Date: 07/03/2018

FIRST INTERNAL ASSESSMENT

Sub: Sensors and Transducers
Time: 3PM-4PM

Sub. Code: 15EE662
Max. Marks: 25

Note: Answer two full questions, draw sketches wherever necessary.

Q. No	Description of Question	Marks	CO	RBT LEVEL
1	a Explain advantages and disadvantages of electrical transducers.	6	324.1	L2
	b Explain the working of linear and angular motion potentiometers. Hence, discuss its advantages and disadvantages.	7	324.1	L2
	OR			
2	a Explain the working of linear variable differential transformer (LVDT). Discuss its advantages and disadvantages.	7	324.1	L2
	b Explain the working of electromagnetic type, electrodynamic type and eddy current type transducers.	6	324.1	L2
3	a Explain the working of capacitive transducer using change in distance between the plates and differential capacitor system.	6	324.1	L2
	b A parallel plate capacitive transducer uses plates of area 300mm^2 which are separated by a distance 0.2mm .	6	324.1	L2
	i) Determine the value of capacitance when the dielectric is air having a permittivity of $8.85 \times 10^{-12}\text{F/m}$.			
	ii) Determine the change in capacitance if a linear displacement reduces the distance between the plates to 0.18mm . Also, determine the ratio of per unit change of capacitance to per unit change of displacement.			
	OR			
4	a Explain piezoelectric materials. Discuss the working of piezoelectric accelerometer with its advantages and disadvantages.	8	324.1	L2
	b A 2.5mm thick quartz piezoelectric crystal having a voltage intensity of 0.055Vm/N is subjected to a pressure of 1.4MN/m^2 . If the permittivity of quartz is $40.6 \times 10^{-12}\text{F/m}$, calculate voltage output and charge sensitivity of the crystal.	4	324.1	L2

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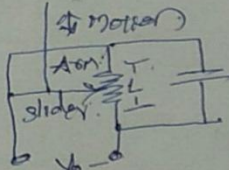
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SCHEME OF EVALUATION

Subject: <u>Sensors & Transducers</u>		Sub Code: <u>16EE662</u>	Date: <u>7/3/2018</u>	Marks	CO's
No.	Bit	Description			
a)		<u>Advantages</u> i) Very small power is reqd. ii) Electrical o/p can be amplified to any desired level. iii) Mass inertia effects are reduced. iv) Suitable size & shape. v) Less friction. vi) o/p can be recorded remotely. vii) o/p can be modified.	4m	6m	30/4
		<u>Disadvantages</u> i) Low reliability ii) Expensive. iii) Low accuracy & resolution.	2m		
b)		 	2m		
		<u>Advan Explanation</u>	3m		
		<u>Advantages</u> i) High o/p. i.e. less expensive. available in different size, simple, Regge-t	1		
		<u>Disadvantages:</u> i) Limited life span is noisy.	1		

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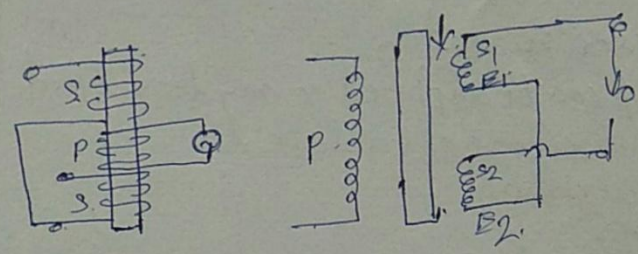
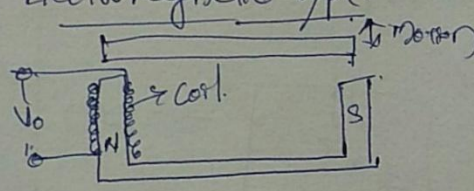
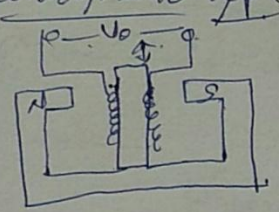
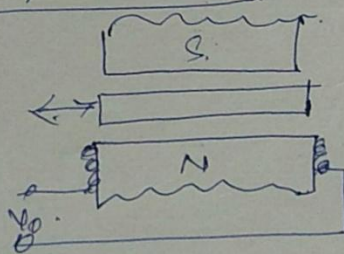
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SCHEME OF EVALUATION

Sem	Subject	Sub Code	Date	Marks	CO's
VI	SST	SEE662	7/3/19		
Q. No.	Bit	Description			
2.	a)		2m	7m	32%
		Explanation	3m		
		Advantages	1m		
		Disadvantages	1m		
	b)	Electromagnetic type.	2m	6m	32%
					
		Electrodynamo type	2m		
					
		Eddy current type.	2m		
					

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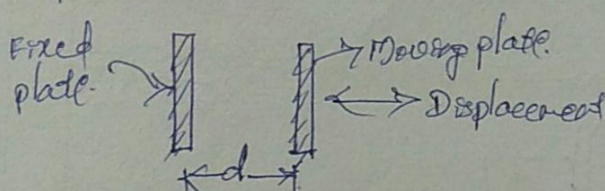
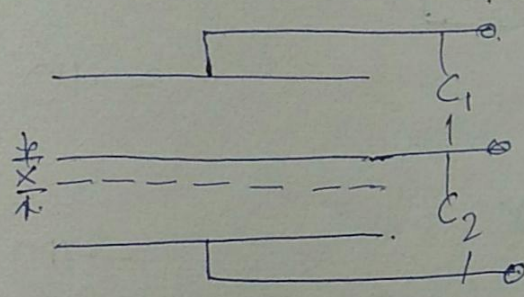


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IA Scheme
2017-18 Even Sem

Page No.: 3/4

Subject: SST		SCHEME OF EVALUATION		Sub Code: SEE662 Date: 7/3/18	
Q. No.	Bit	Description	Marks	CO's	
a)		Capacitive transducer.	2M	6M	32401
					
		Differential capacitor system.	2M	4M	
					
		$C_1 = \frac{\epsilon A}{d+x}, C_2 = \frac{\epsilon A}{d-x}$ $E_1 = E \frac{d+x}{2d}, E_2 = E \frac{d-x}{2d}$ $E_1 - E_2 = E \frac{x}{d}$	2M		
b)	i)	$C = \frac{\epsilon_0 A}{d} = 13.275 \text{ pF}$	2M	6M	32401
	ii)	$AC \pm C = 14.75 \text{ pF}$ $AC = 1.475 \text{ pF}$	2M		
		$\frac{AC}{C} = 1.1$	2M		

Course Coordinator

Dr. Praveen
Module Coordinator

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IA Scheme

2017-18 Even Sem

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SCHEME OF EVALUATION

Sem: II Subject: SST Sub Code: SEE669 Date: 7/3/18

Q. No. Bit Description Marks CO's

4. a) Piezoelectric material.

— 2M 8M 30M

Accelerometer

— 4M

Advantages

— 1M

- i) Small size.
- ii) High o/p
- iii) High sensitivity

Disadvantages

— 1M

- i) Sensitive to temp. change
- ii) Not suitable for f/p freq. less than 10 Hz.

b) i)

$$E = q \cdot P = 192.5 \text{ V}$$

— 2M

4M 30

$$\text{charge sensitivity} = e \cdot g$$

$$= 2.233 \text{ pC/V}$$

— 2M

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