

VALLIAMMAI ENGINEERING COLLEGE
DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION

SUBJECT CODE: CL7102

SUBJECT NAME: TRANSDUCER & MEASUREMENTS

SEMESTER: I-C&I

Unit-I

RESISTIVE, INDUCTIVE AND CAPACITIVE ELEMENTS

PART-A

1. What is meant by strain gauge
2. Mention the advantages and drawbacks of the temperature instability
3. State any one temperature instability problem
4. Sketch the equivalent circuit of inductive element
5. Define gauge factor of a strain gauge
6. A transducer is subjected to sudden change in input. It takes 10 seconds for the transducer to reach equilibrium condition. Find the time constant of the transducer.
7. Classify the mechanical structures used for measurement of displacement, force, pressure, fluid level and velocity
8. For a helical spring obtain the displacement of the spring
9. A capacitor of capacitance 245pF produces resonance at an angular frequency of 5 rad/s. While a capacitor of capacitance 50Pf produces resonance with the record harmonic of this frequency. Calculate the inductance and the self capacitance of the coil.
10. Sketch the equivalent circuit of capacitive element
11. Name the methods used for rotational displacement measurement
12. State the principle of magneto strictive transducer
13. Write the output expression for the differential displacement element
14. State the characteristics of inductive element
15. Name the method used for measurement of liquid level
16. What is meant by polar and non-polar dielectrics in capacitive transducer element
17. Mention the various physical effects employed for measuring the thickness of metal foil
18. What is the use of the signal conditioning circuit
19. State the application of the differential displacement element
20. What is meant by displacement to phase conversion

PART-B

1. Explain in detail about the capacitive elements structure, equivalent circuits and characteristics
2. Describe in detail about the single, differential and single displacement elements
3. Describe the operation of magneto strictive transducer
4. Explain the principle of operation of strain gauge and signal conditioning circuit for the same
5. Obtain the output expression of differential displacement element
6. Explain any one differential displacement element with a application
7. Explain the signal conditioning circuit for temperature compensation of strain gauge
8. Discuss in detail about displacement to phase converters
9. Explain in detail about the inductive elements structure, equivalent circuits and characteristics
10. A strain gauge is bonded to a beam of 0.1m long and has a cross sectional area of 4 cm². Young's modulus for steel is 20.7GN/m². The Strain gauge has a unstamped resistance of 240 ohms. and a

gauge factor of 2.2. When a load is applied the resistance of gauge changes by 0.013 ohms. Calculate the change in length of the steel beam and amount of force applied to the beam

Unit-II

TRANSFORMER, ELECTRODYNAMIC, SERVO AND RESONANT ELEMENTS

Part-A

1. What is synchro transformer?
2. Write the principle of weak-field sensors.
3. List out the merits of weak-field sensors.
4. Write the comparison between the rotating coil and differential coil transformer element.
5. What is a resonator? Mention the various components of it.
6. Write the expression for frequency of vibration of a string.
7. Write down the expression for the frequency of the sound produced by the string.
8. Write the principle of piezoelectric resonator.
9. Write the principle of acoustical resonator.
10. What are electrodynamic elements?
11. Explain the principle of moving coil electrodynamic element.
12. Write the principle of variable reluctance electrodynamic element.
13. Write about electromagnetic flowmeters.
14. Write about non-electrode electromagnetic flowmeter.
15. Sketch the structure of vibrating capsules.
16. What is meant by thermo migration?
17. What are the various elements of weak-field sensors
18. Mention the various components of resonator
19. Write the comparison between differential and rotating coil transformer
20. Write the application of piezoelectric resonator

Part-B

1. Explain about Single core transformer
2. Explain about the Differential core transformer.
3. Explain in detail about vibrating string.
4. Explain Rotating coil transformer.
5. Draw the neat sketch and explain the working of Synchro transformer
6. Explain about vibrating beam with relevant equation.
7. Explain briefly about Moving coil electrodynamic element.
8. Explain in detail about Variable-reluctance electrodynamic element.
9. Briefly explain the piezoelectric resonator with an equivalent circuit.
10. Explain in detail about vibrating cylinders with neat diagram.

Unit-III

MECHANICAL, ACOUSTICAL AND FLOWMETERING ELEMENTS

Part-A

1. Write the short notes about the inertial mass element.
2. Sketch an acoustic low pass filter.
3. Write the principle of ultrasonic flow meter.
4. Explain the working of orifice plate. Write the relevant expression.
5. Identify the causes for temperature drift of diaphragm.
6. Identify the causes for sensitive drift of diaphragm.
7. Explain the working principle of bourdon tube with relevant expression.
8. Write the principle of absolute pressure diaphragm?
9. Draw the different configurations of absolute pressure diaphragm.
10. What is electromagnetic flow meter?
11. What is nano electromagnetic flow meter?
12. Explain Doppler Effect ultrasonic flow meter.
13. Explain clamp on transit time ultrasonic flow meter.
14. Explain wetted ultrasonic flow meter.
15. Explain wide beam ultrasonic flow meter.
16. Write the principle of acoustic low pass filter
17. Write the principle of nano electromagnetic flow meter
18. Mention the importance of acoustical elements in measurements
19. Sketch the Pyroelectric detector
20. State the use of wetted ultrasonic flow meter

Part-B

1. Explain temperature drift & sensitivity to acceleration parameters of diaphragm
2. Explain the operation of ultrasonic type of flow meter.
3. Explain the design of low pass acoustical filter.
4. Classify the transduction element for flow measurement.
5. Explain the working of Pyroelectric detectors
6. Explain the working of nano electrode magnetic flow meter
7. Sketch and explain the stress state of diaphragm.
8. Explain the working of absolute pressure capsules with appropriate diagrams.
9. Explain the working of Thermal detectors
10. Explain the various elements of vibrating measuring instruments.

Unit- IV
OPTICAL MICROSTRUCTURE SENSORS
PART-A

1. What is fiber optic sensor?
2. List the advantages of fiber optic sensor.
3. Mention the applications of fiber optic gyroscope?
4. Write the working principle of photo detectors.
5. Define Schottky effect.
6. What is avalanche breakdown?
7. What is a pyroelectric detector?
8. What is thermal detector?
9. Explain the principle of photo emissive detectors
10. Write the types of fiber optic sensors.
11. Write about phase modulated fiber sensors.
12. Write the working of intrinsic multimode fiber optic sensor.
13. Write the principle of phototransistor.
14. Explain the working of fiber optic gyroscope.
15. Write the working of fiber optic pressure sensor.
16. Write the short notes on avalanche breakdown
17. Name any 2 fibre sensors and give the principle of sensing used
18. State the principle of Avalanche photo diode
19. State the principle of intrinsic multimode fiber optic sensor
20. Write some applications of photo transistor

Part-B

11. Write a detailed note on acoustical element used for measurement.
12. Explain the principle and operation of intrinsic multimode fiber optic sensor
13. Explain the principle and operation of vibrating measuring instruments.
14. Explain in detail about photo emissive detectors.
15. Explain in detail about photoconductive
16. Write a detailed note on fiber optic gyroscope
17. Write a detailed note on reflection sensor.
18. Discuss the operation of avalanche and Schottky photo diode.
19. Explain in detail about phototransistor.
20. Write a detailed note on phase modulated sensor & fiber optic pressure sensor.

UNIT-V
MISCELLANEOUS MINIATURE SENSORS
PART-A

1. Give any two examples of metal oxide sensors.
2. Write a note on solid electrolyte sensors.
3. What is electromechanical micro Sensors?
4. Write the principle of metal oxide sensors?
5. What is meant by Hall Effect
6. Write short notes on metal oxide sensors
7. Describe the function of hall effect sensor
8. List the various types of magnetic sensor
9. Give the uses of Hall Effect sensor
10. State the principle of silicon based sensors
11. Write the principle of Hall effect sensors
12. Give any 2 examples of silicon based sensor
13. What is meant by thermo migration
14. Write a short note on the photo resist development in fabricating micro sensors
15. State the design factor for electromechanical micro Sensors?
16. Name the types of solid state chemical sensors
17. State the difference between chemical sensor and silicon based chemical sensor
18. State the characteristics of magneto strictive transducers
19. State the characteristics of magneto elastic transducers
20. Give the uses of chemical sensors

PART-B

1. Discuss briefly about Metal oxide sensors.
2. Explain in detail about solid electrolyte sensors.
3. Write a detailed note on basic design factor of electromechanical micro Sensors
4. Explain with basic magneto resistive characteristics, the measurement of flux density and Magneto elastic and magneto strictive transducers
5. Discuss in detail the working of electro mechanical micro sensors
6. Explain the basic factors of design involved in electro mechanical micro sensors
7. Explain the silicon based chemical sensor and compare it with other types of chemical Sensor
8. Discuss any one gas sensor based on metal oxide semiconducting sensor
9. Explain any one solid state chemical sensor
10. Explain the hall effect and magneto resistive sensors with diagram and expressions