



ST. ANNE'S

COLLEGE OF ENGINEERING AND TECHNOLOGY

OAN551 – SENSORS AND TRANSDUCERS
UNIT 3 – FORCE, MAGNETIC AND HEADING SENSOR

1. **Load cells are used for measuring _____**
 - a) Large weights only
 - b) Small weights only
 - c) Weights moving in high speed
 - d) Slowly moving weights**

2. **Which of the following arrangements are used in load cells?**
 - a) Tensile strain gauges
 - b) Compressive strain gauges
 - c) Both tensile and compressive strain gauges**
 - d) None of the mentioned

3. **Diaphragm element can also be used for force measurement.**
 - a) False
 - b) True**

4. **Which of the following statement is true for diaphragms?**
 - a) Used for measuring small forces**
 - b) Used for measuring large forces
 - c) Used for measuring dynamic forces
 - d) None of the mentioned

5. **Which sensor can detect nearby objects?**
 - a) Proximity sensor**
 - b) Humidity sensor
 - c) Touch sensor
 - d) Pressure sensor

6. **Which proximity sensor detects metal objects?**
 - a) Capacitive Proximity Sensor
 - b) Inductive Proximity Sensor**
 - c) Ultrasonic Proximity Sensor
 - d) Magnetic Proximity Sensor

7. Which proximity sensor detects positioning of an object?

- a) Inductive Proximity Sensor
- b) Capacitive Proximity Sensor
- c) Optical Proximity Sensor**
- d) Magnetic Proximity Sensor

8. Hall Effect transducer can be used to measure _____

- a) Magnetic field
- b) Angular displacement
- c) Linear displacement
- d) All of the mentioned**

9. Electrical strain gauge works on the principle of _____

- a) variation of resistance**
- b) variation of capacitance
- c) variation of inductance
- d) variation of area

10. The strain gauge is not bonded to the specimen.

- a) True
- b) False**

11. Bonding element in a strain gauge must have _____

- a) zero insulation resistance
- b) low insulation resistance
- c) high insulation resistance**
- d) infinite insulation resistance

12. Commonly used elements for wire strain gauges are _____

- a) nickel and copper**
- b) nickel and gold
- c) gold and brass
- d) silver and aluminium

13. Gauge factor is given by which of the following relation?

- a) $S = \Delta R/R\Delta l$
- b) $S = \Delta R\Delta l/l$
- c) $S = R\Delta l/l$
- d) $S = \Delta R/R\Delta l/l$**

14. Poisson's ratio is given by which of the following relation?

- a) $\mu = -\Delta d/d\Delta l/l$**
- b) $\mu = -\Delta d\Delta l/l$

- c) $\mu = -d\Delta l/l$
- d) $\mu = -\Delta d/d\Delta l$

15. Strain gauge measurement involves _____

- a) Wheatstone bridge**
- b) Kelvin bridge
- c) De Sauty's bridge
- d) Anderson bridge

16. Load cell is used for the measurement of _____

- a) area
- b) force**
- c) mass
- d) length

17. Semiconductor strain gauge uses _____

- a) rectifier circuitry
- b) power electronics circuitry
- c) ordinary bridge circuit
- d) bridge circuit with temperature compensation**

18. Metals in strain gauge construction have _____

- a) non-linear temperature coefficient
- b) linear temperature coefficient**
- c) tangential temperature coefficient
- d) exponential temperature coefficient

19. Hall Effect is a/an _____

- a) Electronic
- b) Magnetic
- c) Galvanic**
- d) Ionizing

20. At equilibrium Lorentz forces will be _____ of Hall Effect force.

- a) Double
- b) Half
- c) Equal**
- d) No proportionality

21. Which of the following represents the correct expression of Lorentz force?

- a) E_H/b
- b) eE_H/b**

- c) eE_H
- d) None of the mentioned

22. Hall Effect is clearly visible in _____

- a) Pure conductors
- b) Semiconductors**
- c) Super conductors
- d) Metals

23. Which of the following represents the output of Hall Effect transducer?

- a) Hall potential**
- b) Emf
- c) Applied voltage
- d) Lorentz Voltage

24. Hall Effect transducer can be used to measure _____

- a) Magnetic field
- b) Angular displacement
- c) Linear displacement
- d) All of the mentioned**

25. Which axis accelerometer is mostly used in IOT?

- a) 2- axis
- b) 3- axis**
- c) 1- axis
- d) Combination of all

26. Accelerometer is the measurement of _____

- a) Velocity/time**
- b) Energy/time
- c) Height/time
- d) Angle/time

27. How many and what are the parts that are present in the accelerometer sensor?

- a) 1, capacitor sensor
- b) 3, piezoelectric effect, Analog display, digital display
- c) 2, piezoelectric effect and capacitor sensor**
- d) 2, Capacitor sensor, digital Display

28. Gyroscope is used for _____

- a) Anti-theft
- b) Capacitive proximity sensing

c) Gaming

d) Angle detection

29. Gyroscope is used to measure _____

a) Linear Acceleration

b) Angular velocity

c) Angular velocity and linear acceleration

d) Linear velocity

30. Theory behind working of accelerometer can be understood from _____

a) Rotary

b) Liner

c) Newtonian mechanism

d) Reciprocating

31. _____ sensor is used for tracking rotation or twist.

a) Gyroscope

b) Temperature

c) Pressure

d) Proximity

32. Which of the following is correct for tactile sensors?

a) Touch sensitive

b) Pressure sensitive

c) Input voltage sensitive

d) Humidity sensitive

33. Change in output of sensor with change in input is _____

a) Threshold

b) Slew rate

c) Sensitivity

d) None of the mentioned

34. Which of the following can be cause for non-zero output when zero input?

a) Bias

b) Slew

c) Offset

d) Offset or bias

35. Which of the following error is caused by a reversal of measured property?

a) Hysterisis

b) Noise

- c) Digitization error
- d) Quantization error

36. Smallest change which a sensor can detect is _____

a) Resolution

- b) Accuracy
- c) Precision
- d) Scale

37. Thermocouple generate output voltage according to _____

a) Circuit parameters

b) Humidity

c) Temperature

d) Voltage

38. Which of the following is not an analog sensor?

a) Potentiometer

b) Force-sensing resistors

c) Accelerometers

d) None of the mentioned

39. Strength of signal doesn't depend upon which of the following factors?

a) Energy flux

b) Dwell time

c) Altitude

d) Reflection

40. Which of the following is not a configuration of a smart sensor?

a) Transducer

b) Network interface

c) Processor

d) None of the mentioned

41. Accelerometer is the measurement of _____

a) Velocity/time

b) Energy/time

c) Height/time

d) Angle/time

42. What is the use of accelerometer in laptops?

a) To rotate the screen

b) To protect hard drives from damage

- c) To get the angle on monitor
- d) To get the linear acceleration

43. What is the rate noise density of gyroscope?

- a) 0.011 dps/ $\sqrt{\text{Hz}}$**
- b) 0.0011 dps/ $\sqrt{\text{Hz}}$
- c) 1.11 dps/ $\sqrt{\text{Hz}}$
- d) 11.1 dps/ $\sqrt{\text{Hz}}$

44. What is the purpose of a gyro in an inertial navigation system?

- a) Space-stabilize the accelerometer**
- b) Angle of rotation
- c) Measure rotation rate
- d) Calculate velocity

45. What is the range of an order of angular rate magnitude that gyros used in military planes need?

- a) 8
- b) 8.5**
- c) 7.1
- d) 3

46. Why are unfloated instruments with ball bearings not suitable for air navigation?

- a) Weight restrictions
- b) High drift rate**
- c) Low drift rate
- d) Power restrictions

47. Which of the following is false with respect to SDF floated gyros?

- a) Wheel is floated at neutral buoyancy
- b) Used in launch vehicles
- c) Three gimbals are used**
- d) Magnetic pickoff used to sense rotation

48. Which of the following spinning wheel gyro has an accuracy of 0.001 deg/hr?

- a) Floated TDF gyro
- b) Electrostatically suspended TDF gyro**
- c) Floated SDF gyro
- d) Unfloated ball bearing gyro

49. The input, output and spin axes of a gyro are always perpendicular to each other.

- a) True**
- b) False

50. Which of the following is false with respect to spinning rotor gyros?

- a) Mechanically complex
- b) High probability of failure
- c) Low run up time**
- d) High power consumption

51. What is the basic principle under which MEMS gyro work?

- a) Sagnac effect
- b) Coriolis effect**
- c) Angular momentum conservation
- d) Mass conservation

52. Which part of the insects acts as gyros?

- a) Wings
- b) Halteres**
- c) Thorax
- d) Legs

53. Which of the following is false with respect to MEMS gyro?

- a) Low failure rate
- b) Low cost
- c) High maintenance**
- d) Less power consumption