



Maratha Vidya Prasarak Samaj's

Rajarshi Shahu Maharaj Polytechnic, Nashik

Udoji Maratha Boarding Campus, Near Pumping Station, Gangapur Road, Nashik-13.

RSM POLY

Affiliated to MSBTE Mumbai, Approved by AICTE New Delhi, DTE Mumbai & Govt. of Maharashtra, Mumbai.

*Subject: - Mechanical Engineering
Measurements
(22443)*



BOARD THEORY

PAPER PATTERN

FOR RET (22443)

Q.1		Attempt any FIVE	5*2=10
	a)	Displacement, Force and Torque Measurement	
	b)	Displacement, Force and Torque Measurement	
	c)	Displacement, Force and Torque Measurement	
	d)	Pressure and Temperature Measurement	
	e)	Flow Measurement	
	f)	Vibration and Strain Measurement	
	g)	Miscellaneous Measurement Sound, speed and humidity measurement	
Q.2		Attempt any THREE	3*4=12
	a)	Introduction to Measurement	
	b)	Vibration and Strain Measurement	
	c)	Pressure and Temperature Measurement	
	d)	Displacement, Force and Torque Measurement	



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Q.3		Attempt any THREE	3*4=12
	a)	Introduction to Measurement	
	b)	Introduction to Measurement	
	c)	Displacement, Force and Torque Measurement	
	d)	Pressure and Temperature Measurement	
Q.4		Attempt any THREE	3*4=12
	a)	Displacement, Force and Torque Measurement	
	b)	Pressure and Temperature Measurement	
	c)	Pressure and Temperature Measurement	
	d)	Vibration and Strain Measurement	
	e)	Miscellaneous Measurement Sound, speed and humidity measurement	
Q.5		Attempt any TWO	2*6=12
	a)	Introduction to Measurement	
	b)	Flow Measurement	
	c)	Miscellaneous Measurement Sound, speed and humidity measurement	
Q.6		Attempt any TWO	2*6=12
	a)	Flow Measurement	
	b)	Vibration and Strain Measurement	
	c)	Miscellaneous Measurement Sound, speed and humidity measurement	



CLASS TEST - I

PAPER PATTERN

COURSE: - Mechanical Engineering Measurements (22443)

PROGRAMME: - Mechanical Engineering

Syllabus: -

Unit No.	Name of the Unit	Course Outcome (CO)
1	Introduction to Measurement	CO-443.01
2	Displacement, Force and Torque Measurement	CO-443.02
3	Pressure and Temperature Measurement	CO-443.03

Q.1	Attempt any FOUR 4*2=8Marks	Course Outcome (CO)
a)	Introduction to Measurement	CO-443.01
b)	Introduction to Measurement	CO-443.01
c)	Displacement, Force and Torque Measurement	CO-443.02
d)	Displacement, Force and Torque Measurement	CO-443.02
e)	Pressure and Temperature Measurement	CO-443.03
f)	Pressure and Temperature Measurement	CO-443.03
Q.2	Attempt any THREE 3*4=12 Marks	
a)	Introduction to Measurement	CO-443.01
b)	Introduction to Measurement	CO-443.01
c)	Displacement, Force and Torque Measurement	CO-443.02
d)	Displacement, Force and Torque Measurement	CO-443.02
e)	Pressure and Temperature Measurement	CO-443.03
f)	Pressure and Temperature Measurement	CO-443.03



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CLASS TEST - II

PAPER PATTERN

COURSE: - Mechanical Engineering Measurements (22443)

PROGRAMME: - Mechanical Engineering

Syllabus: -

Unit No.	Name of the Unit	Course Outcome (CO)
4	Flow Measurement	CO-443.04
5	Vibration and Strain Measurement	CO-443.05
6	Miscellaneous Measurement Sound, speed and humidity measurement	CO-443.06

Q.1	Attempt any FOUR	4*2=8Marks	Course Outcome (CO)
a)	Flow Measurement		CO-443.04
b)	Flow Measurement		CO-443.04
c)	Vibration and Strain Measurement		CO-443.05
d)	Vibration and Strain Measurement		CO-443.05
e)	Miscellaneous Measurement Sound, speed and humidity measurement		CO-443.06
f)	Miscellaneous Measurement Sound, speed and humidity measurement		CO-443.06
Q.2	Attempt any THREE	3*4=12 Marks	
a)	Flow Measurement		CO-443.04
b)	Flow Measurement		CO-443.04
c)	Vibration and Strain Measurement		CO-443.05
d)	Vibration and Strain Measurement		CO-443.05
e)	Miscellaneous Measurement Sound, speed and humidity measurement		CO-443.06
f)	Miscellaneous Measurement Sound, speed and humidity measurement		CO-443.06



COURSE OUTCOME

(CO)

COURSE: - Mechanical Engineering Measurements (22443)

PROGRAMME: - Mechanical Engineering

CO. NO.	Course Outcome
CO- 443.01	Use relevant instrument for measuring displacement
CO- 443.02	Use relevant instrument for measuring force and torque
CO- 443.03	Use relevant pressure and temperature instrument for measuring
CO- 443.04	Use relevant instrument for measurement of flow
CO- 443.05	Select relevant instrument for measurement of vibration and strain
CO- 443.06	Select relevant instrument for speed and sound measurement



1. Introduction to Measurement

Position in Question Paper

Total Marks-18

Q.2. a) 4-Marks.

Q.3. a) 4-Marks.

Q.3. b) 4-Marks.

Q.5. a) 6-Marks.

Descriptive Question

1. Define measurement, State its significance.
2. Define measurement, state its types.
3. Define the term Range & Span.
4. Define the term Accuracy & precision.
5. What is the function of transducer?
6. What are the active & passive transducers? Give two examples of each.
7. Define the terms Threshold, Resolution, Repeatability & Reproducibility.
8. Define Instrument & Give the classification for it.
9. Define the terms Fidelity, Dynamic error, overshoot & measuring lag.
10. Define Transducer. Explain the classification of transducer.
11. Define Error state classification of error & explain any one.
12. Define Range
13. Name any two contact and Non-contact transducers
14. Distinguish between Threshold and Resolution
15. Compare between Dead zone and Dead time with the help of graphical representation
16. Explain term- Dead zone and Hysteresis
17. Distinguish between Threshold and Resolution
18. List the factors depends on selection of transducer for specific application? Explain with suitable example



19. Draw a block diagram of generalized measuring system showing all the elements. State the functions of each element
20. Explain term-fidelity and overshoot.
21. Distinguish between Threshold and Resolution.
22. List the different types of errors in measurement system and explain any one.
23. State the working principle of piezo-electric transducer and its applications.

MCQ Question

(Total number of Question=Marks*3=12*3=36)

Note: Correct answer is marked with **bold**.

1. The degree of closeness of the measured value of a certain quantity with its true value is known as
 - a) **Accuracy**
 - b) Precision
 - c) Standard
 - d) Sensitivity
2. The ability by which a measuring device can detect small differences in the quantity being measured by it, is called its
 - a) Damping
 - b) **Sensitivity**
 - c) Accuracy
 - d) None of the above
3. The following is an internationally recognized and accepted unit system
 - a) MKS
 - b) FPS
 - c) **SI**
 - d) All of the above
4. Error of measurement =
 - a) **True value – Measured value**
 - b) Precision – True value
 - c) Measured value – Precision
 - d) None of the above
5. Among the following which statement about a 'reliable instrument' is correct?
 - a) **It gives reproducible results within specified limits**
 - b) It has errors of same size and sign under the same working conditions
 - c) It has good frequency response
 - d) It gives linear characteristics within the entire range
6. The resolution of a system refers to
 - a) Difference between the true and measured value of the process variable
 - b) **Smallest change of input for which there will be change of output**
 - c) Retardation of the response



- d) All of these
7. The largest change in the measured variable which produces no instrument response is known as
- a) threshold
b) dynamic error
c) **dead zone**
d) none of these
8. State which of the following describes the linearity of instrument
- a) range of inaccuracy which can be tolerated
b) largest change in the measured value which produces no instrument response
c) **relationship between output and the input**
d) none of these
9. In measurement systems, which of the following are undesirable static characteristic
- a) sensitivity and accuracy
b) drift, static error and dead zone
c) reproducibility and non-linearity
d) **drift, static error, dead zone and non-linearity**
10. Function of transducer is to convert
- a) electrical signal into non electrical quantity
b) **non electrical quantity into electrical signal**
c) electrical signal into mechanical quantity
d) electrical signal into non electrical signal
11. Capacitive transducers operate upon the principle (s) of
- a) variation of over-lapping area of plates
b) variation of separation of plates
c) variation of relative permittivity of dielectric material between two plates
d) **all of the above**
12. Self-generating transducers are _____ transducers.
- a) **Active**
b) Passive
c) Second
d) Inverse
13. The measurement of a quantity
- a) is an act of comparison of an unknown quantity with another quantity
b) is an act of comparison of an unknown quantity with a known quantity whose accuracy may be known or may not be known
c) **is an act of comparison of an unknown quantity with a predefined acceptable standard which is accurately known**
d) none of the above
14. The measurand is
- a) output
b) **measured variable**



- c) secondary signal
d) Tertiary signal
15. Direct method is used to measure
a) Temperature
b) Pressure
c) **Length**
d) Voltage
16. The temperature measurement by a thermocouple is
a) **primary measurement**
b) secondary measurement
c) tertiary measurement
d) immediate measurement
17. Hysteresis of an instrument means:
a) **The change in the same reading when input is first increased and then decreased**
b) The reliability of the instrument
c) The repeatability of the instrument
d) The inaccuracy due to change in temperature
18. The basic purpose of instruments is to
a) **allow measurements to be made**
b) transmit the information
c) change signals
d) Any of the above.
19. The accuracy depends upon
a) precision of instrument
b) precision of method
c) good planning
d) **all of the above**
20. Which of the following errors can arise, as a result of mistakes in reading, parallax, improper instrument location and inadequate lighting?
a) Construction error
b) Transmission error
c) **Observation error**
d) Translation error
21. A measuring system consists of
a) Sensors
b) Variable conversion elements
c) Signal processing elements
d) **All of these**
22. The desirable static characteristics of a measuring system are
a) Accuracy and reproducibility
b) **Accuracy, sensitivity and reproducibility**
c) Drift and dead zone
d) Static error
23. The ratio of maximum displacement deviation to full scale deviation of the instrument is called
a) Static sensitivity
b) Dynamic deviation
c) **Linearity**
d) Precision or accuracy



24. The measurement of reproducibility of an instrument given an indication of
- a) Resolution
 - b) Damping
 - c) Accuracy
 - d) **Precision**
25. The dynamic error of an instrument is defined as
- a) The difference is full scale reading and actual readings
 - b) **The difference in actual and indicated values**
 - c) The difference in two consecutive readings of the scale
 - d) None of them
26. In electrical measuring instruments electrical energy is converted to
- a) **Mechanical energy**
 - b) Heat energy
 - c) Chemical energy
 - d) Light energy
27. Dead time of the instrument is
- a) The time required by an instrument to begin to respond to a change in the measurand
 - b) **The time required by an instrument for initial warming up**
 - c) The largest change of input quantity for which there is no output of the instrument
 - d) None of the above
28. Damping in an instrument provides
- a) Counter torque to deflection torque
 - b) Good accuracy
 - c) **Braking action on a meter pointer**
 - d) Starting torque on the meter pointer
29. instruments indicate the instantaneous value of the electrical quantity being measured at the time at which it is being measured?
- a) Absolute
 - b) **Indicating**
 - c) Recording
 - d) Integrating
30. The spring material used in a spring control device should have the following property:
- a) should be non-magnetic
 - b) should have low-temperature co-efficient
 - c) should not be subjected to fatigue
 - d) **all of the above**
31. The use of instruments is merely confined within laboratories as standardizing instruments.
- a) **absolute**
 - b) indicating
 - c) recording
 - d) integrating
32. The measurement refers to which of the following:
- a) Primary signal
 - b) Measured variable



- c) Output d) All of the above
33. In present day measurements systems
- a) Direct methods are commonly used.
 - b) **One of the direct methods are limited but indirect methods are commonly used.**
 - c) Both indirect and direct methods are commonly used.
 - d) All of the above
34. Errors which may be variable both in magnitude and nature (positive or negative) are classified as
- a) Hysteresis errors
 - b) **Random errors**
 - c) Systematic errors
 - d) Interaction errors
35. Loading effect is principally caused by Instruments.
- a) High resistance
 - b) **Low sensitivity**
 - c) High sensitivity
 - d) High range
36. The essential elements of electronic instruments are:
- a) Transducer.
 - b) Signal conditioner.
 - c) Indicating devices.
 - d) **All of the above.**
37. The process of determining the amount, degree or capacity by comparison with accepted standard of the system units being used is known as:
- a) Accuracy
 - b) Resolution
 - c) **Measurement**
 - d) Precision
38. The smallest change in a measured variable to which an instrument will respond is:
- a) Accuracy
 - b) **Resolution**
 - c) Measurement
 - d) Precision
39. Is the measure of the consistency or repeatability of measurements?
- a) Accuracy
 - b) Resolution
 - c) Measurement
 - d) **Precision**
40. If a measurement is precise then:
- a) It may be precise
 - b) It may not be precise
 - c) **Both a and b**
 - d) It is not necessary
41. Is one of the basic error that occurs frequently due to improper use of an instrument?
- a) **Gross error**
 - b) Systematic error
 - c) Random error
 - d) None of the above
42. Dynamic characteristics of an instrument are:



-
- a) Speed of response
b) Fidelity
c) Dynamic error
d) All of the above

2. Displacement, Force and Torque Measurement

Position in Question Paper

Total Marks-18

Q.1. a) 2-Marks.

Q.1. b) 2-Marks.

Q.1. c) 2-Marks.

Q.2. d) 4-Marks.

Q.3. c) 4-Marks.

Q.4. a) 4-Marks.

Descriptive Question

1. Write any four selection factors of Displacement transducer.
2. List any four applications of displacement transducer.
3. State applications of potentiometer & write its working principle.
4. State any four specifications of L.V.D.T.
5. Draw & sketch characteristics of force measurement system.
6. Write any four applications of load cell.
7. Explain capacitive transducer with one application.
8. Draw neat sketch of LVDT & explain its working.
9. Explain with neat sketch working of strain gauge load cell.
10. Explain the construction & working of rotary transformer torque sensor.
11. Explain with neat sketch the working of eddy current dynamometer.
12. Explain the working of 'Slip Ring' with neat sketch
13. Draw the constructional details of 'Transmission Dynamometer'
14. State the working principle of potentiometer
15. State the functions of 'Dynamometer'



16. Enlist different types of high pressure gauges.
17. Classify dynamometer's,
18. List the different applications of potentiometer.
19. Draw the construction and explain working of nutating disc type positive displacement meter.
20. Explain construction and working of R.V.D.T.
21. Draw creep curve for force transducer. State its significance.
22. Enlist the different types of load cell
23. Explain the construction of Quartz Force sensor

MCQ Question

(Total number of Question=Marks*3=12*3=36)

Note: Correct answer is marked with **bold**

1. When an elastic member is used in conjunction with a strain gauge, it is called a
 - a) proving ring
 - b) absorption dynamometer
 - c) prony brake
 - d) **load cell**
2. LVDT which is an instrument for the measurement of displacement, works on the principal of
 - a) Linear inductance
 - b) Non - linear inductance
 - c) **Mutual inductance**
 - d) Linear capacitance
3. Potentiometer is used for the measurement of
 - a) Linear displacement
 - b) Angular displacement
 - c) Non - linear displacement
 - d) **Only (1) and (2)**
4. The displacement measuring instruments is / are
 - a) Potentiometer
 - b) LVDT
 - c) RVDT
 - d) **All of these**
5. _____ is used for measuring torque in rotating parts in machines.
 - a) Accelerometer
 - b) **Dynamometer**
 - c) Tachometer
 - d) Potentiometer
6. Which of the following arrangements are used in load cells?
 - a) Tensile strain gauges
 - b) Compressive strain gauges

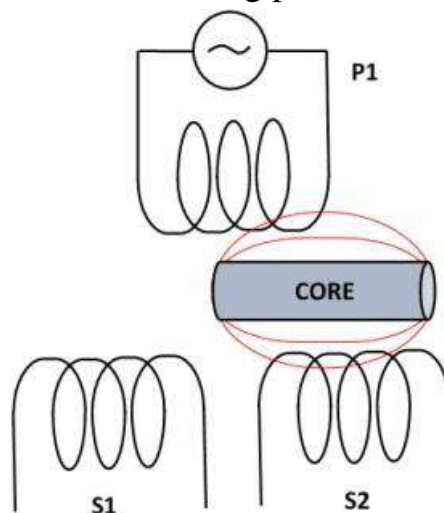


- c) **Both tensile and compressive strain gauges**
d) Either tensile or compressive strain gauges
7. What type of torque is associated with braking system of a vehicle, when brakes are applied?
a) Stationary torque
b) Dynamic torque
c) **Static torque**
d) Distinctive torque
8. Which of the following conversion is correct for load cell?
a) Force to strain
b) Force to displacement
c) Force to voltage
d) **Both force to strain and force to displacement**
9. Pneumatic load cells are suitable for measuring
a) Very low pressure
b) **Very high pressure**
c) Intermediate range of pressure
d) All of the mentioned
10. Which of the following device can be used for force measurement?
a) **Beams**
b) Bellows
c) Capsule
d) Bourdon tube
11. Which of the following is an absorption type dynamometer?
a) **prony brake dynamometer**
b) epicyclic-train dynamometer
c) torsion dynamometer
d) none of the mentioned
12. Which of the following is a characteristic feature of a dynamometer
a) It can measure torque
b) **It can measure frictional resistance**
c) It can measure the balancing force
d) It can act as a speedometer
13. LVDT is an/a _____ transducer
a) Magnetostriction
b) Inductive
c) Resistive
d) **Eddy current**
14. In a LVDT, the two secondary voltages
a) Are independent of the core position
b) **Vary unequally depending on the core position**
c) Vary equally depending on the core position
d) Are always in phase quadrature
15. Load cells are used for the measurement of
a) Stress
b) **Weight**
c) Strain
d) Velocity
16. Identify the Load Cell



- a) S-Type
 b) Shear
 c) **Button**
 d) Canister

17. The output voltage of LVDT for following position is

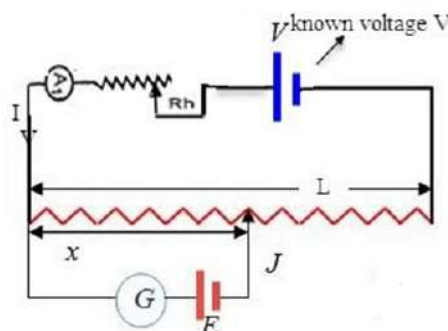


- a) $E_o = E_{s1} - E_{s2} = 0$
 b) **$E_o = E_{s1} - E_{s2} = \text{negative}$**
 c) $E_o = E_{s1} - E_{s2} = \text{Positive}$
 d) $E_o = E_{s1} - E_{s2} = \text{Positive / Negative}$

18. For regulating fan speed is used

- a) Linear Potentiometer
 b) RVDT
 c) **Rotary Potentiometer**
 d) LVDT

19. The equation for following linear potentiometer is Where, V_i = input Voltage, V_o = Output Voltage



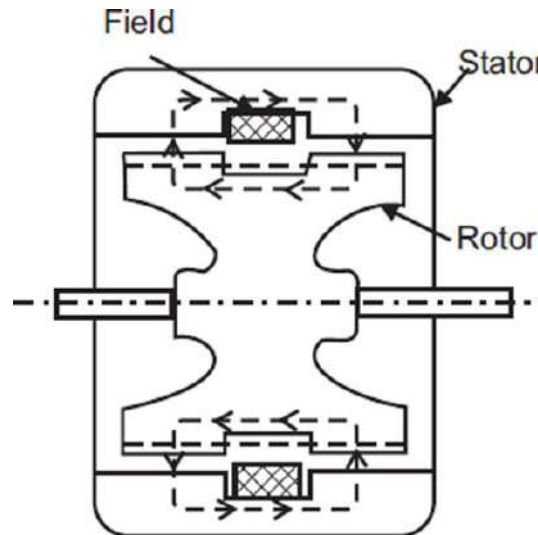
a) $L = (V_o / V_i) * x$

c) $L = (V_i / V_o) * x$

b) $x = (V_o / V_i) * L$

d) $x = (V_i / V_o) * L$

20. Identify the given dynamometer



a) Strain Gauge Transmission Dynamometer

b) Prony Rope Dynamometer

c) **Eddy Current Dynamometer**

d) Belt Dynamometer

21. The potentiometric recorders have

a) High sensitivity

b) **High sensitivity and independence of lead length**

c) Low sensitivity

d) None of these

22. Which of the following devices can be used for measuring torque?

a) Helical spring

c) Bellows

b) **Flat spiral spring**

d) Diaphragm

23. Which of the following is true for torque measurement?

a) Measurement of applied force only

b) Measurement of length of arm

c) **Measurement of force and length of arm**

d) Measurement of velocity of material

24. Which of the following represents the correct relationship between angular displacement and torque?

a) **Direct proportionality**

c) Equal magnitude

b) Inverse proportionality

d) None of the mentioned



25. Which of the following represents the correct position of strain gauges in torque measurement?
- a) 90° with each other
 - b) Parallel to shaft axis
 - c) Perpendicular to shaft axis
 - d) **45° from shaft axis**
26. Capacitance sensor can measure very small displacement. It can be formed by varying
- a) Separation
 - b) Area
 - c) Permittivity
 - d) **Either (a) or (b) or (c)**
27. In rotary variable differential transformer, the mutual inductance between the primary and secondary coils varies
- a) **Linearly with the angular displacement**
 - b) Non - linearly with the angular displacement
 - c) Linearly with the linear displacement
 - d) Non - linearly with the linear displacement
28. How does it become possible to reduce the interference level generated corresponding to the stray magnetic fields in LVDT?
- a) **By Shielding**
 - b) By Grounding
 - c) Both a & b
 - d) None of the above
29. Potentiometer transducers are used for the measurement of
- a) Pressure
 - b) Displacement
 - c) Humidity
 - d) **Both (a) and (b)**
30. Capacitive transducers are normally employed for _____ measurements
- a) Static
 - b) **Dynamic**
 - c) Transient
 - d) Both static and dynamic
31. LVDT windings are wound on ____
- a) Steel sheets
 - b) Aluminium
 - c) **Ferrite**
 - d) Copper
32. The application of LVDT is
- a) Joint motion
 - b) Finger movement
 - c) **Limb movement**
 - d) Heart wall motion
33. Potentiometric resistance transducer measures _____
- a) **linear displacement**
 - b) rectangular displacement
 - c) square displacement
 - d) triangular displacement
34. Resistance potentiometer consists of _____



- a) capacitive element
b) **resistive element**
35. Resistance potentiometers convert mechanical displacement into _____
a) **electrical signal**
b) chemical signal
c) physical output
d) kinetic energy
36. Strain gauge is a _____
a) inductive transducer
b) **resistive transducer**
c) capacitive transducer
d) mechanical transducer
37. Strain is defined as _____
a) change in height per unit height
b) change in weight per unit weight
c) **change in length per unit length**
d) change in diameter per unit diameter
38. Stress is defined as _____
a) diameter per unit area
b) length per unit area
c) weight per unit area
d) **force per unit area**
39. Which of the following represents a moment of inertia of force acting tangential to a cylindrical rod?
a) **FR**
b) F/R
c) F2R
d) FR2
40. In which of the following dynamometers does the energy produced by the engine is used for doing work?
a) Prony brake dynamometer
b) Rope brake dynamometer
c) Absorption dynamometer
d) **Epicyclic train dynamometer**
41. For a rope brake dynamometer, the flywheel is cooled with soapy water because _____
a) **Energy is absorbed by the dynamometer**
b) Energy is used to do work
c) Energy is provided by the motor
d) Energy supplied is more
42. For which of the following dynamometers the driving torque on the shaft is not uniform and it is subjected to severe oscillations?
a) **Prony brake**
b) Band brake
c) Belt transmission
d) Epicyclic train
43. Which of the following dynamometers have a pinion meshing with two gears?
a) Prony brake dynamometer
b) **Epicyclic train dynamometer**
c) Torsional dynamometer
d) Belt transmission dynamometer



44. Which of the following dynamometer type differs from an Epicyclic train dynamometer?
- a) Belt transmission
 - b) Torsional dynamometer
 - c) Transmission dynamometer
 - d) Prony brake dynamometer**
45. Which of the following dynamometer belongs to a different type.
- a) Prony brake dynamometer**
 - b) Torsional dynamometer
 - c) Epicyclic train dynamometer
 - d) Belt transmission dynamometer
46. Which of the following is not a characteristic of the rope brake dynamometer?
- a) Energy loss in friction
 - b) Energy absorbed by frictional resistances**
 - c) Energy utilization in work
 - d) Energy can be either utilized to do work or can be reused.
47. Which of the following is not a characteristic of the Torsional dynamometer.
- a) Conversion of energy into heat**
 - b) Conversion of energy into work
 - c) Utilization of engine power
 - d) Energy can be either utilized to do work or can be reused.



3. Pressure & Temperature Measurement

Position in Question Paper

Total Marks-18

Q.1. c) 2-Marks.

Q.2. c) 4-Marks.

Q.3. d) 4-Marks.

Q.4. b) 4-Marks.

Q.4. c) 4-Marks.

Descriptive Question

1. Define pressure. & list pressure measurement gauges.
2. State advantages & disadvantages of Pirani gauge.
3. Draw neat sketch for pressure measurement using Bellows.
4. State the materials used for Bourdon tube.
5. Draw & sketch the liquid in glass thermometer.
6. State Seebeck & peltier effect.
7. Compare thermocouple & thermistor.
8. What are the different materials used for developing thermocouple.
9. Explain with neat sketch working of Mc-lead gauge.
10. Explain construction & working of Pirani gauge.
11. Explain construction & working principle of Bourdon gauge.
12. Explain with neat sketch photoelectric pressure transducer.
13. Explain the working of liquid pressure thermometer with neat diagram.
14. Explain with neat sketch platinum resistance thermometer. (PT-100)
15. Explain construction & working of bimetallic thermometer.
16. Explain the working of optical pyrometer with neat sketch.
17. Explain with sketch the working principle of "Thermistor"



18. Draw a neat sketch of "Pressure Thermometer"? Explain its working

19. List the elements of thermocouple

20. Name metals used for Bimetallic strip

MCQ Question

(Total number of Question=Marks*3=12*3=36)

Note: Correct answer is marked with **bold**

- Which of the thermocouple one will choose to measure the temperature of 500°C?
 - Chromal Alumal (Cr Al)
 - Iron Constantan (Fe K)**
 - Platicum-Platinum Rhydium (Pt Pt Rh)
 - None of the above
- Cr Al thermocouple can be used to measure the temperature upto
 - 500° C
 - 800° C
 - 1200° C**
 - 1800° C
- The output of thermocouple is in the range of
 - Volts
 - Millivolts**
 - Amperes
 - Milliamperes
- A resistance temperature detector (RTD) is used to sense the temperature. Which of the following converter will be used to receive a milliampere signal from RTD?
 - M_U/M_A Converter
 - A/M_A Converter
 - R/M_A Converter**
 - None of the above
- A dead-weight pressure gauge works on_____.
 - D'Arsonval principle
 - Abbe's principle
 - Archimedes' principle**
 - D'alembert's principle
- McLeod gauge works on .
 - Newton's law
 - Hook's law
 - Boyle's law**
 - Pascal's law
- In a Pirani gauge, the pressure is related to the _____.
 - thermal conductivity of the gas**
 - the volume of the gas
 - mass transfer of the gas
 - composition of the gas
- A McLeod gauge is used to measure _____.
 - gauge pressure
 - atmospheric pressure
 - vacuum pressure**
 - absolute pressure



9. A dead-weight pressure gauge is used for _____.
- a) **static pressure measurement**
 - b) dynamic pressure measurement
 - c) high-vacuum measurement
 - d) low-volume measurement
10. Optical sensors used for the displacement measurement works on the principal that
- a) Intensity of light increases with distance
 - b) **Intensity of light decreases with distance**
 - c) Intensity of light remains constant with distance
 - d) Intensity of light increases with time
11. Which of the following conversion take place in bourdon tubes?
- a) **Pressure to displacement**
 - b) Pressure to voltage
 - c) Pressure to strain
 - d) Pressure to force
12. Capsules are made from diaphragms'
- a) **True**
 - b) False
13. The ionization gauge an instrument used for the measurement of
- a) **Very low pressure**
 - b) Medium pressure
 - c) High pressure
 - d) Very high pressure
14. When visual indication of pressure level is required then the instrument generally used is
- a) **Monometers**
 - b) Diaphragm sensors
 - c) Bourdon tube
 - d) Resonant wire device
15. Identify the thermocouple type with the highest temperature limit from those listed here:
- a) Type J
 - b) Type K
 - c) **Type S**
 - d) Type T
16. When the reference junction is the same temperature as the measurement junction in a thermocouple circuit, the output voltage (measured by the sensing instrument) is:
- a) **Zero**
 - b) Reverse polarity
 - c) Noisy
 - d) AC instead of DC
17. Reference junction compensation is necessary in thermocouple-based temperature instruments because:
- a) Copper extension wire has a tendency to corrode
 - b) Thermocouples are inherently nonlinear
 - c) **The reference junction generates a temperature-dependent voltage**
 - d) The junction's electrical resistance varies with temperature
18. A type J thermocouple is made of the following metals:
- a) Aluminum and Tungsten
 - b) **Iron and Constantan**



- c) Platinum and Platinum/Rhodium alloy
d) Copper and Constantan
19. Output of a bimetallic element will be
a) Strain
b) Pressure
c) **Displacement**
d) Voltage
20. Which of the following is true for bimetallic type thermometer?
a) Two metals have same temperature coefficients
b) **Two metals have different temperature coefficient**
c) One metal is cooled always
d) One metal is heated always
21. _____ measure dynamic pressure.
a) Bourdon tube pressure gauges
b) Barometric sensor
c) **Piezoelectric pressure sensor**
d) Piezoresistive pressure sensor
22. The monomeric fluid density should be _____ than that of flowing fluid.
a) **greater**
b) smaller
c) equal
d) very small
23. Which one of these thermometers is portable as well as simple to use?
a) Constant-volume gas thermometer
b) resistance thermometer
c) Thermocouple
d) **Mercury-in-glass thermometer**
24. Cr Al thermocouple can be used to measure the temperature upto
a) 500° C
b) 800° C
c) **1200° C**
d) 1800° C
25. Manometer is used for measuring _____
a) **pressure**
b) speed
c) Fathometer
d) density
26. Which instrument is used to measure medium pressure?
a) **Bourdon tube pressure gauges**
b) Barometric sensor
c) Piezoelectric pressure sensor
d) Piezoresistive pressure sensor
27. Which pressure instrument is used in weather networks?
a) Bourdon tube pressure gauges
b) **Barometric sensor**
c) Piezoelectric pressure sensor
d) Piezoresistive pressure sensor
28. Which instrument uses the change in electric resistance to measure the pressure?
a) Bourdon tube pressure gauges
b) Barometric sensor
c) Piezoelectric pressure sensor
d) **Piezoresistive pressure sensor**
29. Which of the following statements about pressure transmitters are correct?



Statement 1: It contains pressure sensor and signal conditioner.

Statement 2: There are four main types of pressure transmitters.

e) True, False

g) False, True

f) True, True

h) False, False

30. One pascal is equivalent to _____ of force applied over an area of one meter squared.

e) **one newton**

g) 1000 newton

f) 100 newton

h) 10 newton

31. What is relation between PSI and Bar?

a) **1 Bar = 14.5 Psi**

c) 1 Bar = 201 Psi

b) 1 Bar = 20 Psi

d) 1 Bar = 1 Psi

32. The thermocouple circuit which is used to measure temperature works on ____.

a) **Seebeck effect**

c) Thomson effect

b) Peltier effect

d) none of the above

33. In McLeod gauge,

a) High pressure fluid is expanded to a low pressure which is read by the monometer technique

b) Low pressure fluid is compressed to a high pressure which is read by the bourdon technique

c) High pressure fluid is expanded to a low pressure which is read by the bourdon technique

d) Low pressure fluid is compressed to a high pressure which is read by the monometer technique

34. In electric resistance thermometer, the thermometric property is

a) electric current passing through a metal wire

b) resistance of a metal wire

c) voltage between two extreme end points of a metal wire

d) none of the above

35. Every temperature measuring instrument makes use of a physical property of a substance in order to measure temperature objectively, which physical property is used by Mercury-in-glass thermometer?

a) Electromotive force

b) Volume of a fixed mass of liquid

c) Resistance of a piece of metal

d) Pressure of a fixed mass of gas at constant volume

36. The sensitivity of a thermometer refers to

a) how quickly the thermometer can register change in temperature



- b) **the amount of change in thermometric property for a unit change in temperature**
- c) the min and max temperatures that the thermometer can measure
- d) None of the above
37. Thermometer that is best suited for measuring rapidly changing temperatures is
- a) Constant-volume gas thermometer
- b) resistance thermometer
- c) **Thermocouple**
- d) Mercury-in-glass thermometer



4. Flow Measurement

Position in Question Paper

Total Marks-14

Q.1. d) 2-Marks.

Q.5. b) 6-Marks.

Q.6. a) 6-Marks.

Descriptive Question

1. Define flow .state the classification of flow transducers.
2. Define Reynolds number. State the equation for it.
3. State advantages & disadvantages of venturi meter.
4. Draw neat sketch coriolis flow meter.
5. List suitable applications of ultrasonic flow meter.
6. List advantages & disadvantages of hot wire anemometer.
7. Draw neat sketch of orifice flow meter & explain its working.
8. Draw &explain working of Pitot tube.
9. Draw neat sketch of Dall tube & explain its working.
- 10.Explain the working of Rotameter with help of neat diagram.
- 11.Explain the working of Rotary Vane flow meter with neat sketch.
- 12.Draw neat sketch of transit time (time difference type) ultrasonic flow meter.
- 13.Name the materials used for orifice plate
- 14.State the applications of Ultrasonic flow meter
- 15.Explain Hot wire anemometer with neat sketch
- 16.State the applications of Orifice meter, Venturi tube and pitot tube



- a) Venturi
b) **Dall flow tube**
11. The instrument which is not suitable for the application in automatic control scheme
a) **Rotameters**
b) Pitot static tube
c) Flow nozzle
d) Pitot static tube
12. Turbine meters are generally preferred for
a) **Low-viscosity and high flow measurements**
b) High viscosity and low flow measurements
c) High viscosity and high flow measurements
d) Low viscosity and low flow measurements
13. The flow meter which is replacing the differential pressure meters in its applications is
a) **Vortex-shedding flow meter**
b) Electromagnetic flow meters
c) Ultrasonic flow meters
d) All of these
14. Materials for orifice plates are _____
a) steel
b) stainless steel
c) Phosphor-bronze
d) **All of the above**
15. Rotameter is a
a) Variable head type flowmeter
b) **variable area type flowmeter**
c) Positive displacement type flowmeter
d) none of these
16. Which material is generally preferred in Rotameters?
a) Silicon
b) wood
c) copper
d) **glass**
17. Rotameters are applicable for
e) Tar
f) chemical liquors
g) high viscous fluid
h) **low viscous fluid**
18. When there is no flow through rotameter, the float rests at
a) Top of meter tube
b) **bottom of meter tube**
c) Middle of meter tube
d) any one position
19. When using the orifice plate for flow measurement, the fluid flowing through the orifice will create a _____ drop.
a) Temperature
b) Voltage
c) Velocity
d) **Pressure**
20. The pressure of the fluid is _____ at the upstream of the orifice plate.
a) Higher
b) Lower
c) Uniform
d) None of above



29. Which of the following converts flow to rotational motion?
- Rotatic vane system**
 - Rotameter flow system
 - Both rotameter flow system and rotatic vane system
 - None of the mentioned
30. Positive displacement flow meters are
- variable area flow meter
 - differential pressure flow meter
 - quantity flow meter**
 - None of the above
31. The rate at which fluid flows through a closed pipe can be determined by
- Determining the mass flow rate
 - Determining the volume flow rate
 - Either (a) or (b)
 - None of these
32. Match the following:
- | | |
|----------------------------|--|
| i. Flow nozzle - | (a) Direct indicating type |
| ii. Rotameter - | (b) Usable for all types of flow with good accuracy |
| iii. Nutating disc - | (c) Cheaper than venturi, more accurate than orifice |
| iv. Reciprocating piston - | (d) Common with liquid, less accurate |
- 1(c), 2(a), 3(d), 4(b)**
 - 1(a), 2(b), 3(c), 4(d)
 - 1(b), 2(a), 3(d), 4(c)
 - 1(a), 2(c), 3(b), 4(d)
33. Units of volumetric flow rates _____
- m³/hr
 - litre/sec
 - gallons/hr
 - All of the above**
34. The accuracy of Nutating disc type flowmeter is _____
- ±0.2
 - ±1
 - ±0.5
 - ±2.5
35. Turbine flowmeters are not widely used in
- Military application
 - petroleum
 - textile**
 - aerospace
36. The flow rate of nutating disc type flowmeter ranges from
- 1-10gpm
 - 15-500gpm
 - 1000-1500gpm**
 - none of these



5. Vibration and Strain measurement

Position in Question Paper

Total Marks-16

Q.1. e) 2-Marks.

Q.2. b) 4-Marks.

Q.4. d) 4-Marks.

Q.6. b) 6-Marks.

Descriptive Question

1. Define free vibrations and forced vibrations.
2. List advantages & disadvantages of inductive type transducer.
3. Draw block diagram of FET analyzer.
4. What are materials used for strain gauges?
5. State the criteria on which strain gauges are selected.
6. Explain working of velocity pick-up with neat sketch.
7. Draw neat sketch of accelerometer & explain its working.
8. Explain the working principle of capacitive pick-up for vibration measurement.
9. Explain Bounded type strain gauge with neat diagram.
10. Draw & explain semiconductor strain gauge.
11. Define term "Gauge factor"
12. State the functions of Accelerometer
13. Differentiate between Inductive Pick up and Capacitive Pick up
14. Draw a labelled sketch of Stroboscope



MCQ Question

(Total number of Question=Marks*3=10*3=30)

Note: Correct answer is marked with **bold**

- Which of the following statements is true about stroboscope?
 - Stroboscope is non-contact type frequency instrument**
 - Stroboscope can measure frequency upto 5 Hz
 - Stroboscope uses electromagnetic radiations to measure frequency
 - All of the above
- Which type of instruments do not require separate power source for measuring vibratory response of a vibratory system?
 - Active instruments
 - Passive instruments**
 - Both a. and b.
 - None of the above
- Which of the following vibrometers have frequency ratio $(\omega/\omega_n) \ll 1$?
 - Accelerometers**
 - Velometers
 - Both a. and b.
 - None of the above
- Which type of monitoring system uses stroboscope to measure speed of the machine?
 - Portable condition monitoring system
 - Basic condition monitoring system**
 - Computer based condition monitoring system
 - None of the above
- Strain gauge measurement involves _____
 - Wheatstone bridge**
 - Kelvin bridge
 - De Sauty's bridge
 - Anderson bridge
- Electrical strain gauge works on the principle of _____
 - variation of resistance**
 - variation of capacitance
 - variation of inductance
 - variation of area
- The strain gauge is not bonded to the specimen.
 - True
 - False**
- Bonding element in a strain gauge must have _____
 - zero insulation resistance
 - low insulation resistance
 - high insulation resistance**
 - infinite insulation resistance
- Commonly used elements for wire strain gauges are _____
 - nickel and copper**
 - nickel and gold
 - gold and brass
 - silver and aluminium
- Proper functioning of a strain gauge depends on _____



- a) strain
b) stress
- c) **bonding**
d) length of wire
11. Gauge factor is given by which of the following relation?
a) $S = \frac{\Delta R/R}{\Delta l/l}$
b) $S = \frac{\Delta R}{\Delta l/l}$
c) $S = \frac{R}{\Delta l/l}$
d) **$S = \frac{\Delta R/R}{\Delta l/l}$**
12. In wire wound strain gauges, the change in resistance is due to
a) Change in diameter of the wire
b) Change in length of the wire
c) **Change in both length and diameter**
d) Change in resistivity
13. Bonded wire strain gauges are
a) Exclusively used for construction of transducers
b) Exclusively used for stress analysis
c) **Used for both stress analysis and construction of transducer**
d) Pressure measurement
14. The drawbacks of strain gauges are
S1: Low fatigue life
S2: They are expensive, brittle and sensitive to temperature
S3: Poor linearity
a) S1 and S2
b) **S2 and S3**
c) S1 and S3
d) S1 only
15. In foil strain gauge the thickness of foil varies from
a) **2.5 micron to 6 micron**
b) 25 micron (or) less
c) 25 micron to 60 micron
d) 2.5 micron to 5 micron
16. In a foil strain gauge, strain is detected through _____
a) a capacitance element
b) a resistance wire
c) a gold foil
d) **a metal foil**
17. Gauge factor in a strain gauge must be _____
a) **high**
b) low
c) medium
d) small
18. Resistance of the strain gauge must be _____
a) zero
b) small
c) **large**
d) medium
19. Strain gauge has a _____
a) tangential
b) exponential



- c) non-linear
d) **linear**
20. Strain gauge has a _____
a) **low temperature coefficient of resistance**
b) high temperature coefficient of resistance
c) zero temperature coefficient of resistance
d) infinite temperature coefficient of resistance
21. Semiconductor strain gauges are used for _____
a) low gauge factor values
b) **high gauge factor values**
c) zero gauge factor value
d) infinite gauge factor value
22. Strain gauge works on the principle of _____
a) piezo-electric effect
b) barkhausen criterion
c) **piezo- resistive effect**
d) feedback element effect
23. Semiconductor strain gauge uses _____
a) rectifier circuitry
b) power electronics circuitry
c) ordinary bridge circuit
d) **bridge circuit with temperature compensation**
24. A semiconductor strain gauge consists of how many dummy gauges?
a) **2**
b) 4
c) 6
d) 10
25. Metals in strain gauge construction have _____
a) non-linear temperature coefficient
b) **linear temperature coefficient**
c) tangential temperature coefficient
d) exponential temperature coefficient
26. Vibration measuring instruments are classified on the basis of _____.
a) contact between the vibrating system and measuring instrument
b) the requirement of power source
c) method of measurements
d) **all of the above**
27. FFT analyzer can be used to find the _____.
a) natural frequencies
b) mode shapes
c) **both natural frequencies and mode shapes**
d) none of the above
28. In FFT Spectrum Analyzer, the filter is used to _____.
a) **reject unwanted signals**



- b) sets the level of the signals to be fed to the A/D converter
c) convert analog signals into digital signals
d) converts digital signals into analog signals
29. In FFT Spectrum Analyzer, the attenuator is used to _____.
- a) reject unwanted signals
b) **sets the level of the signals to be fed to the A/D converter**
c) convert analog signals into digital signals
d) converts digital signals into analog signals
30. In FFT Spectrum Analyzer, the A/D converter is used to _____.
- a) reject unwanted signals
b) sets the level of the signals to be fed to the A/D converter
c) **convert analog signals into digital signals**
d) converts digital signals into analog signals
31. In FFT Spectrum Analyzer, the D/A converter is used to _____.
- a) reject unwanted signals
b) sets the level of the signals to be fed to the A/D converter
c) convert analog signals into digital signals
d) **converts digital signals into analog signals**
32. From the following, which one is used in an accelerometer?
- a) Dielectric crystals
b) **Piezoelectric crystals**
c) Optic crystals
d) Diamond
33. In FFT Spectrum Analyzer, FFT stands for _____.
- a) Frequency Fourier Transform
b) Fast Fourier Transmission
c) Frequency Fourier Transmission
d) **Fast Fourier Transform**
34. In an accelerometer, the spring used should be _____.
- a) **short**
b) long
c) either short or long
d) size of spring does not effect
35. The accelerometers are commonly used in vibration measurement due to their _____.
- a) small size and low sensitivity
b) the large size and high sensitivity
c) the large size and low sensitivity
d) **small size and high sensitivity**
36. In a spring-mass system, which of the following force is not considered?
- a) Spring force
b) **Damping force**
c) Accelerating force
d) A and B
37. Which of the following is true regarding $\epsilon > 1$?
- a) Transmitted force is less than the applied force
b) Spring force is less than the applied force



- c) Damping force is less than the applied force
d) **Transmitted force is greater than the applied force**
38. From the following, which one is also known as low-frequency Transducer?
a) Stroboscope
b) Accelerometer
c) **Vibrometer**
d) None of the above
39. The frequency range of a vibrometer is generally _____.
a) **1 Hz to 10 Hz**
b) 10 Hz to 50 Hz
c) 100 Hz to 500 Hz
d) 1000 Hz to 5000 Hz
40. In vibrometer, the relative motion between the mass and vibrating body is converted into proportional _____.
a) current
b) **voltage**
c) resistance
d) ampere



6. Miscellaneous measurement, Sound, Speed & Humidity measurement

Position in Question Paper

Total Marks-18

Q.1. f) 2-Marks.

Q.4. e) 4-Marks.

Q.5. c) 6-Marks.

Q.6. c) 6-Marks.

Descriptive Question

1. Write any four sound characteristics.
2. Draw neat sketch of carbon microphone.
3. What is tachometer? State different types of tachometers.
4. Define humidity & state the units for humidity.
5. Explain with neat sketch sound measurement using electrodynamic microphone.
6. Draw neat sketch of sling psychrometer & write its working.
7. Explain with neat sketch the working of slipping clutch tachometer.
8. Explain with neat sketch working of contact less electrical tachometer. (inductive pick-up tachometer).
9. Classify Tachometers
10. List different types of Speed Measuring instruments.
11. Describe the working principle of 'Mechanical tachometer'
12. Draw the constructional details of Sling Psychrometer? State its applications



MCQ Question

(Total number of Question=Marks*3=12*3=36)

Note: Correct answer is marked with **bold**

1. A hygrometer is
 - a) Convenient for measuring specific gravity
 - b) An instrument that measures gas weight
 - c) **Any instrument that measures moisture content**
 - d) Another name for psychrometer
2. Noise is _____
 - a) an unwanted noise
 - b) an irritant
 - c) a source of stress
 - d) **all of the above**
3. Sound is measured in
 - a) Hertz
 - b) **Decibel**
 - c) ppm
 - d) none of the above
4. Noise pollution can cause
 - a) hypertension
 - b) hearing loss
 - c) sleep disturbances
 - d) **all of the above**
5. Following is used for measuring intensity of sound
 - a) **Sound level meter**
 - b) Frequency meter
 - c) both (A) and (B)
 - d) None of the above
6. Which of the following terms is a useful quantity to describe the loudness of a sound?
 - a) **intensity**
 - b) frequency
 - c) pitch
 - d) wavelength
7. A dynamic microphone changes sound into an electrical signal using
 - a) **Carbon granule movement inside of a magnetic field.**
 - b) Capacitive effects of a moving plate.
 - c) A moving coil inside a magnetic field.
 - d) Piezoelectric effects.
8. Microphones convert sound, which is _____, into electrical energy.
 - a) magnetic
 - b) **vibrating air**
 - c) made only by vocal chords
 - d) natural airflow
9. What is humidity sensor?
 - a) **Hygrometer**
 - b) Gyroscope
 - c) Sesimoscope
 - d) Sundial



10. Relative humidity is a function of _____
- Ambient temperature
 - Water vapor pressure
 - Ambient temperature and Water vapor pressure**
 - Dryness
11. A hair element is used because of it :
- Measures absolute humidity
 - Is the most accurate type of humidity measurement
 - Is simple and inexpensive**
 - Measures dew point
12. Relative humidity is:
- The moisture present in a body of air expressed as a percentage of saturation at the existing temperature**
 - The moisture in a body of air, in grams per cubic meter
 - The temperature at which moisture will condense from a body of air
 - The ratio of actual moisture in a volume of air to the moisture that would exist at optimum comfort in a similar volume
13. A psychrometer is :
- A hair element instrument
 - A “wet and dry bulb” humidity instrument**
 - Resistance potentiometers An instrument that senses psychological disturbances
 - An instrument that reads directly in dew point
14. Which of the following device is used to measure humidity?
- Hydrometer
 - Hygrometer**
 - Psychrometer
 - Anemometer
15. Which of the following can be measured using tachometers?
- Angular speed**
 - Linear speed
 - Acceleration
 - Vibration
16. Which of the following is not a speed measuring instrument?
- Psychrometer**
 - Stroboscope
 - Tachometer
 - All of the above
17. Sling psychrometer is used to measure:
- only dry bulb temperature
 - only wet bulb temperature
 - dry and wet bulb temperature
 - relative humidity**
18. Which temperature can be measured by an instrument called psychrometer?
- dry bulb temperature
 - wet bulb temperature
 - both a. and b.**
 - none of the above



19. Electrodynamic Microphone works on principal of ____
- a) **Moving Conductor in Magnetic Field**
 - b) Moving Conductor in Electric Field
 - c) Converting sound to Electric Signal
 - d) Converting Electric to sound Signal
20. Carbon Microphone works on principal of ____
- a) Moving Conductor in Magnetic Field
 - b) Moving Conductor in Electric Field
 - c) **Converting sound to Electric Signal**
 - d) Converting Electric to sound Signal
21. Advantages of Carbon Microphone is/are
- a) Low Cost
 - b) Inherently High Output
 - c) Peaked frequency response
 - d) **All of above**
22. Application of Carbon Microphone is/are
- a) Telephone system
 - b) Public address system
 - c) Recording Device
 - d) **All of above**
23. A device used to measure humidity is called as
- a) Hygrometer
 - b) Psychrometer
 - c) **Both**
 - d) None of above
24. Amount of water vapor in air is regarded as ____
- a) Water vapor
 - b) **Humidity**
 - c) Mildness
 - d) Pressure
25. _____ is not type of Mechanical Tachometers
- a) Revolution counter
 - b) Centrifugal force
 - c) **Stroboscopic**
 - d) Slipping clutch
26. Factors influencing humidity includes
- a) Temperature
 - b) **Water**
 - c) Pressure
 - d) Osmosis
27. ____ is not advantages of slipping clutch tachometer.
- a) Simple in operation
 - b) Simple in construction
 - c) Measured high shaft speed
 - d) **Measured low shaft speed**
28. Electrical tachometer based on principal of transducer produced electrical signal ____
- a) **Proportional to rotational speed**
 - b) Proportional to rotational acceleration
 - c) Inversely Proportional to rotational speed
 - d) Inversely Proportional to rotational acceleration
29. Eddy current tachometer used to measure speed upto ____



- a) 800 rpm
b) 100 rpm
- c) **1200 rpm**
d) 1400 rpm
30. The tachometer in which relative perpendicular motion between magnetic field and conductor results in voltage produced in conductor is _____
- a) Eddy Current Tachometer
b) **Tachogenerator**
c) Stroboscope
d) Frequency Type Tachometer
31. In automobile speedometer _____ tachometer is used.
- a) **Eddy Current Tachometer**
b) Tachogenerator
c) Stroboscope
d) Frequency Type Tachometer
32. Which of the following is correct for AC and DC tachometers?
- a) Sensitivity of AC tachometer is very high
b) **Sensitivity of DC tachometer is very high**
c) Sensitivity of both are equal
d) None of the mentioned
33. Two phase induction motor can be used as AC tachometers.
- a) **True**
b) False
34. Types of contact-less electrical tachometers are:
- a) Inductive pick-up
b) Capacitive pick-up
c) Photo-electric
d) **All of above**
35. Revolution counter can measure speed satisfactorily upto _____
- a) 1000-2000 rpm
b) **2000-3000 rpm**
c) 3000 – 4000 rpm
d) None of above
36. Tachoscope used to measure speed upto _____
- a) 1000 rpm
b) 2000 rpm
c) 4000 rpm
d) **5000 rpm**