Uka Tarsadia University (Diwaliba Polytechnic)
Diploma in Mechanical Engineering
Assignment (Metrology & Instrumentation-020020307)

Unit-1 Linear and Angular Measurement

2 marks

1] Give the basic objectives of Inspection.
2] Why inspection becomes necessary in industries?
3] Give only the functions of inspection.
4] Differentiate: Accuracy and Precision.
5] Differentiate: Centralized and Decentralized inspection.
6] State the elements of measuring system and factors affecting the measurement.
7] Explain specification.
8] Explain the need of end standard.
9] Differentiate between line and end standard giving one example.
10] Explain the system of computer-aided inspection.
11] Explain Wringing process of slip gauge.
12] Classify angular measuring instruments.
13] Classify clinometers.
14] Explain the concept of "V" mark on angle gauge.
15] Explain the method of arranging angle gauge.
16] Describe minimum three uses of angle gauge.
17] List the factors affecting accuracy of sine bar.
18] Sine bar is not recommended to measure angle greater than 45°.Why?
19] Short note on tapper gauge.
20] Explain the method of measuring angle of a job with clinometers.
21] Explain how spirit level is used to measure angles.
22] Indicate the readings on Vernier calliper (Least count-0.02mm) : I) 5.10 mm II) 26.68
23] Indicate the readings on Micrometre (Least count-0.01mm) : I) 2.17 mm II) 4.68 º
24] Indicate the readings on Vernier bevel protector (Least count- 5') : I) 50 º 40' II) 89 º 45'

3 Marks

1] Explain with example interchangeability and selective assembly.
2] Explain need of standard and specification.
3] Explain errors in measurement.
4] What do you mean by standard? Explain in brief.
5] Draw the sketch of Vernier calliper and explain it.

6] Draw the sketch of Micrometer and explain in brief.
7] Explain the working principle of sine bar with sketch and also list the precautions in the use of sine bar.
8] Discuss sine bar and how will you measure slope of lathe centre or taper of drill with the help of sine bar?
9] Define sensitivity of spirit level. List the factors affecting it. Also list the use of spirit level.
10] Explain the applications of sine centre and sine table.
11] Explain with neat sketch working principle of autocollimator.
12] Explain with neat sketch working principle of angle dekkar.
13] Explain the application of autocollimator, angle dekkar and clinometers.
14] Write down short notes on any two: ટૂંક નોંધ લખો:1)Angle gauge , 2)Surface plate, 3)Clinometer.

Unit-2 Measurement of Geometrical Tolerances and Surface Roughness

2 Marks:

1] Give application of dial indicator.
2] Write precaution observed while using dial indicator.
3] Describe straight edge method of measuring straightness.
4] Explain the concept of Flatness.
5] Explain with sketch ovality and lobbing.
6] Explain the meaning of squareness
7] Explain the meaning of primary and secondary texture.
8] Differentiate between: Roughness and waviness
9] Differentiate between : Primary and secondary texture.
10] State limitations of microscopic method of surface testing.
11] Write the advantages and disadvantages of ‘M’ and ‘E’ method.
12] State limitations of stylus and skid instruments.
13] Draw and explain symbol of surface roughness.
14] Explain procedure to check flatness using auto collimator and spirit level.
15] Explain calibration of stylus instrument using two slip gauges.

3 Marks:

1] Give comparison between Vernier caliper, micrometer and dial indicator.
2] Explain working principle and mechanism of dial indicator.
3] Explain construction of dial indicator with sketch.
4] List out the methods of measuring straightness and explain any one in brief.
5] Explain the wedge method of measuring straightness.
6] Describe autocollimator method to measure straightness in brief.
7] List out the methods for measuring flatness and explain any one of them in brief.

8] Explain high spot method and optical flat method for checking flatness.
9] Explain three errors on circular component with sketch.
10] Explain V-block and dial indicator method of rounding testing.
11] State different methods of testing roundness and explain anyone.
12] Explain indirect method to measure surface roughness.
13] Explain the dial indicator method of testing squareness.
14] Explain working principle and parts of stylus-skid type instrument.
15] Explain the working principle of Tomlimson surface method with neat sketch.
16] Name different stylus and skid instruments used for surface roughness measurement. Explain anyone and state its limitations.
17] Explain the working principle, operation and advantages of profilograph with neat sketch.
18] Explain working principle of Telysurf measuring instruments.
19] Explain tracer type Profilogram and Double Microscopy method for roughness testing.
20] List three basic units indicating surface roughness and explain any two of them.

Unit-3 Gear and Thread Measurement

2 MARKS:

1] Explain line of action and pressure angle of spur gear with neat sketch.
2] Draw gear tooth Vernier calliper.
3] Compare chordal thickness method and constant chord method.
4] Sketch the method of measuring eccentricity of gear with reference to its axis of rotation.
5] Explain the importance of tool room microscope method for testing of small gears.
6] Draw the Sketch of screw thread micrometre.
7] Draw a neat sketch screw thread and its main elements.
8] Explain tapper parallels methods to measure minor diameter.
9] Explain roller and slip gauges method to measure minor diameter by sketch only.
10] Define following i) Crest ii) Thread angle iii) Pitch iv) Effective diameter.
11] List the method available for pitch measurement.
12] Give the limit gauges for screw thread.
13] What is the use of thread cast?
14] Define best size wire and write mathematical equation.
15] List the equipment for measurement of screw thread pitch and effective diameter.
16] List different error in screw thread.
17] List different thread cast method.
18] Why sulfur is used for repairing thread cast?
19] List out thread measuring instruments.
20] Write the function of screw thread ring gauge.
21] Which instrument is used to measure thread pitch?

3 MARKS:

1] List out various gears used in engineering and mention applications of each of them.
2] Explain important elements of spur gear with neat sketch.
3] List different methods of checking gear tooth thickness and explain anyone.
4] Explain the constant chord method used to measure thickness of gear tooth.
5] Explain the working principle of David Brown gear tooth form tester with neat sketch.
6] What is constant chord for spur gear? Explain the advantages of constant chord method over chordal thickness method for measuring gear tooth thickness.
7] Explain the working principle of the method for testing involute gear tooth profile.
8] Explain two wire method in detail.
9] Explain the Limit gauges for screw thread measurement with limitation.
10] Explain measurement method of external thread elements.
11] Explain any one method for measurement of pitch.
12] Explain tool makers microscope.
13] Explain errors in screw thread in brief.
14] Describe the one wire method and three wire method for measuring Effective diameter of thread.
15] Explain periodic error and progressive error of screw thread with sketch.
16] Explain optical comparator with neat sketch.
17] Explain any two thread cast method for internal screw thread measurement.

Unit-4 Limit Gauges, Transducers and Sensors

2 Marks:

1] Classify the transducers.
2] Write advantages of transducer.
3] List out properties of gauge materials.
4] Differentiate:
   i) Plug gauge – ring gauge
   ii) Go member – not go member
   iii) Measurement – gauging
   iv) Active transducer – Passive transducer
5] Write uses of following gauge:
   i) Pin gauge
   ii) Combined gauge
   iii) Position gauge

iv) Filler gauge
v) Angle gauge
vi) Receiving gauge

6] Enlist the precautions required while using limit gauge.
7] Draw the figure of typical limit gauge to check larger size holes.
8] What is piezo-electric effect?
9] Design limit gauge to check hole diameter 30±0.05 mm.
10] Define the following terms: [174]
i) Accuracy
ii) Precision
iii) Resolution
iv) Threshold
v) Dead zone
vi) Sensitivity
vii) Linearity
viii) Hysteresis
11] Define following terms related with limiting gauges.
i) Gauge
ii) Fits
iii) Limits
iv) Tolerance
v) Allowance
vi) Tailor's principle
vii) Fundamental Deviation
viii) Clearance fit
12] State function of transducers.
13] List out analog transducer.
14] Write advantages of limit gauges.
15] The reading of temperatures in a furnace are given below. Find the accuracy of measuring instrument. Temp. ˚C: 850,860,855,865,860,850,845. (Ans-855±10 ^{o}C)
16] Enlist static characteristic of instruments.

3 Marks:

1] Give the classification of gauges.
2] Explain working principle of capacitance type transducer.
3] Explain working principle of inductance type transducer.
4] Write short notes with sketch: LVDT

5] Write short notes with sketch: Piezo electric transducer
6] Write short notes with sketch: Torque meter
7] Explain working principle of Resistance type transducer (Strain gauge transducer).
8] Explain principle of self-generating(active) and analog transducer.
9] Write down application of various transducer.
10] Draw the block diagram of generalized measuring system & explain it.

Unit-5 Non-Destructive Testing

2 marks:

1] State objectives of non-destructive testing.
2] Write down advantages of ultrasonic method of testing.
3] Give difference between destructive test and non-destructive test.
4] Write down advantages of NDT.
5] Explain the purpose of NDT.
6] List the various non-destructive testing method.
7] What is magnaflux test?
8] Why Non Destructive testing is required?
9] Define Non Destructive testing.
10] Liquid penetrant test is used for inspect which defects?
11] Key disadvantage of magnetic particle testing method.
12] Which material is used as magnetic powder in magnetic particle testing method?
13] Give the frequency range of sound waves in ultrasonic test.
14] Give the function of transmitter probe in ultrasonic testing.
15] Define "Echo" in ultrasonic testing method.
16] Give names of testing methods for identification of metals and alloys.

3 Marks:

1] Explain in brief X-ray testing method.
2] What do you mean by dye penetrant test? With neat sketch explain the procedure of conducting this test.
3] With neat sketch explain radiographic test.
4] Explain magnaflux test principle and procedure.
5] Explain magnetic particle test.

6] Give any five testing methods, list out defects; its reveals and its applicability.

Unit-6 Temperature, Pressure and Flow Measurement

2 Marks:

1] Difference between inclined and differential manometer.
2] Explain the function of positive displacement meter.
3] Differentiate between Resistance Thermometer and Thermistor.
4] Differentiate between Resistance Thermometer and Thermocouple.
5] Explain principle of thermometer.
6] Draw the neat figure : i) Cistern or well type manometer
ii) Bourdon tube pressure gauge
iii) Radiation pyrometer
iv) Differential manometer

7] Short note on :
i) Pitot tube
ii) Orifice meter
iii) Diaphragm type pressure gauge
iv) Bellow type pressure gauge
v) Bimetallic thermometer

8] Explain thermistor in short.
9] State advantages and disadvantages of optical pyrometer.
10] State working principle of thermocouple.
11] Explain method to calibrate pressure gauge.
12] State any two error involved in temperature measurement and suggest their remedy.
13] Describe flow measuring system for corrosive liquid.
14] .Explain how flow meter is selected?
15] Explain mass flow meter.
16] Explain ultrasonic meter.
17] Give difference between volumetric flow meter and rate flow meter.

3 Marks:

1] Explain Bourdon tube pressure gauge with sketch.
2] Give the different types of expansion thermometer and explain any one.
3] List the different electric pressure transducer describe any one.
4] Explain working principle of volumetric flow meter.
5] Explain working principle of Rotameter with neat sketch.

6] List the temperature measuring instruments working on radiation principle. Explain with neat sketch optical pyrometer.

7] Explain with neat sketch nutating disc meter with its merits and demerits. State its applications.

8] Classify the flow measuring devices and explain the working of Venturi meter with a neat sketch

9] Explain how pressure gauge is calibrated with help of Dead weight piston gauge with sketch.

10] Explain construction and working principle of hot anemometer with sketch.