



**DHANALAKSHMI SRINIVASAN
COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING**

ME -6504 METROLOGY & MEASUREMENTS

QUESTION BANK

PART-A

UNIT-I CONCEPT OF MEASUREMENT

1. What is measurement? Give its types.
2. Distinguish between line standard and end standard.
3. What is the relationship between sensitivity and range?
4. State the difference between primary and secondary transducers.
5. Define the term „sensitivity“
6. What you mean by sensitivity of a measuring instrument?
7. Define „precision“ and „accuracy“
8. Define readability.
9. Define the term repeatability.
10. Define the term reliability.
11. What is hysteresis?
12. State the dynamic characteristics of simplified measuring system.
13. Define systematic errors.
14. Distinguish between relative error and random error.
15. Mention the various methods used for limiting temperature errors.
16. What are the sources of error?
17. Define calibration.
18. What are the principles of High-precision measurements?
19. What is resolution?
20. What are the applications of measurements?

UNIT-II LINEAR & ANGULAR MEASUREMENT

1. Define - Metrology
2. Why laser is preferred in Engineering Metrology?
3. List any four linear measuring instruments.
4. Give the advantages of digital vernier caliper.
5. What is laser micrometer?
6. Discuss the relative merits and demerits of micrometer and vernier caliper.
7. What is wringing of gauge blocks?
8. Describe the precautionary measures to be taken at various stages of using slip gauges.
9. How the gauge blocks are selected to built-up the length of 45.525mm?
10. What are constructional requirements of a good sine bar?
11. What are the chances of errors in using sine bars?
12. What is the advantage of using laser beam in interferometry?
13. What is the use of Autocollimator in mechanical measurements?
14. State “Taylor”s principle of gauge design”
15. What are the limitations of sine bar?
16. Name any two materials commonly used or gauges.
17. What is a comparator?



DHANALAKSHMI SRINIVASAN
COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING

18. Classify the comparator according to the principles used for obtaining magnification.
19. What is the principle of working of pneumatic comparator?
20. What is the constructional difference between an autocollimator and an angle dekkor?

UNIT-III FORM MEASUREMENT

1. Define the effective diameter of thread.
2. Name the two corrections to be applied for the measurement of effective diameter.
3. What is meant by “Best size wire” in screw thread measurement?
4. How Taylor’s principle is applied to screw thread gauge?
5. Explain drunken error in screw threads.
6. What is the helix angle of M 50x3 2-Start thread?
7. Define Lead.
8. What are the various methods used for measuring the gear tooth thickness?
9. Why is monochromatic light used in interferometry instead of white light?
10. State the methods used for checking gear tooth profile.
11. Define constant chord.
12. Define the term cut-off length with respect to surface roughness measurement.
13. Define –Lays. Mention any four of its type.
14. Define Straightness.
15. Define concentricity.
16. What is gear runout?
17. What is secondary texture of a surface?
18. What is the symbol for fully defining surface roughness?
19. Name the various stylus probe instruments used for surface finish measurement.
20. The outside diameter of a gear is 110mm and the number of teeth is 20. What is the module of gear?

UNIT-IV LASER & ADVANCES IN METROLOGY

1. What do you mean by alignment test on machine tools?
2. Mention the types of CMM.
3. What is CNC CMM?
4. What are the benefits of using CMM?
5. Define Machine Vision.
6. Mention any four advantages of column type CMM.
7. Name the types of accuracy specifications used for CMM.
8. State any two applications of laser in machine tool metrology.
9. What is the advantage of using laser beam interferometry?
10. Why is monochromatic light used in interferometry instead of white light?
11. What is the purpose of retro-reflectors in LASER interferometers?
12. What is laser micrometer?
13. Define axial slip of machine tool.
14. What are the advantages of computer aided inspection?
15. Distinguish between co-ordinate and conventional metrology.
16. State the applications of CMM in reverse engineering.
17. Why laser is preferred in engineering metrology?



**DHANALAKSHMI SRINIVASAN
COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING**

18. List out the different methods of dimensional measurements using laser.
19. List out the merits of CAI.
20. What is interferometer? Name the different types of interferometer.

UNIT-V

MEASUREMENT OF MECHANICAL PARAMETERS

1. State any two principles of force measurement.
2. What is the general rule used for accelerometers to provide satisfactory performance?
3. Define – Torque.
4. Differentiate between force and torque.
5. List any methods employed for measuring torque.
6. What are the differences between orifice and Venturimeter?
7. Write the working principle of hot wire anemometer.
8. List the instruments used for measuring temperature.
9. What is the working principle of thermocouple?
10. Give the composition and useful temperature range of any one commercial thermocouple.
11. How is flow measured using ultrasonic flow meter?
12. What are pyrometers? Mention the types.

UNIT – I

CONCEPT OF MEASUREMENT

1. How are end standards derived from line standard? Explain.
2. With suitable example, explain the difference between precision and accuracy.
3. Enumerate the describe characteristics of precision measuring instruments? (AU, Apr“08)
4. Describe the different types of errors in measurement and their causes. (AU, Dec“05)
5. Write short notes on:
 - (i) calibration (ii) Uncertainty (iii) Reporting results (AU, Dec“07, Dec“08 & Apr“08)
6. Define “systematic errors” and explain the causes of those errors with suitable example.
(AU, Dec“08)
7. Explain various types of systematic and random measurement errors with suitable examples.
(AU, Dec“08, Apr“08)
8. What is the need of calibration? Explain (AU, Dec“06)

16 Marks

1. Give the structure of generalized measuring system and explain. (AU, Apr“04 & Dec“07)
2. Explain the classification of various measuring methods. ((AU, Dec“06 & Dec“08)



**DHANALAKSHMI SRINIVASAN
COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING**

3. Distinguish between and give appropriate examples in each case:

(i) Repeatability and reproducibility

(ii) Systematic and Random errors

(iii) Static and dynamic response (AU, Apr'04 & Dec'06)

4. Discuss the different types of errors and how they can be eliminated? (AU, Dec'07)

UNIT – II

LINEAR & ANGULAR MEASUREMENT

8 Marks

1. What are the general characteristics and selection of measuring instrument? (AU, Nov'04)

2. Explain with a neat sketch how a Vernier caliper is used for linear measurements.

(AU, Nov'09)

3. Describe with the help of a neat, a Vernier bevel protector. (AU, Dec'03 & Dec'08)

4. Describe the various components of Bevel protractor. (AU, Apr'08)

5. With neat diagram explain the construction and working principle of depth micrometer?

(AU, Dec'06)

6. Explain the thread micrometer with neat sketches. (AU, Apr'08)

7. Explain the working principle of laser micrometer. (AU, Dec'04)

8. Explain how slip gauges are checked for quality. (AU, Dec'04)

9. Describe a method of determining an absolute length of slip gauges using interferometer.

(AU, Dec'07)

10. Explain mathematically why error in sine bar increases when the angle being measured exceeds 45° .

(AU, June'08)

11. Why is sine bar not suitable for measuring angles above 45° ? (AU, Nov'09)

12. How the displacements are measured using laser interferometer? (AU, Nov'04)

13. Sketch and describe the optical system of a laser interferometer? (AU, Nov'03)

14. Explain the working of alignment telescope and mention its applications. (AU, Nov'04)

15. Discuss the working principle of Angle Dekkor with a neat sketch. (AU, Apr'08)

16. Discuss any four applications of pneumatic comparator with schematic diagrams.

(AU, Apr'04)

17. Explain the working principle of Opto-mechanical comparator with a neat sketch.

(AU, Nov'04)



**DHANALAKSHMI SRINIVASAN
COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING**

16 Marks

1. How is a Vernier height gauge specified? Describe briefly the constructional requirements of different types of a Vernier height gauge? (AU, Dec⁰⁷)
2. Explain the working principle of AC laser interferometer and how the straightness is measured? (AU, Apr⁰⁴)
3. What is auto-collimator? Explain with the help of neat sketches, the principle and construction of an auto-collimator. (AU, Nov⁰³, Apr⁰⁴, Dec⁰⁶ & Dec⁰⁷)
4. With neat sketch explain the construction and working principle of differential pneumatic comparator.
(AU, Dec⁰⁶ & Dec⁰⁷)
5. How are the taper angle of bore and dove tail angles of the specimen are checked using standard balls, gauge blocks and vernier? (AU, Nov⁰⁴)

UNIT – III

FORM MEASUREMENT

8 Marks

1. How are the major and minor diameters of thread measured? (AU, Nov⁰⁴)
2. Derive an expression for estimation of best size wire. (AU, Dec⁰⁸ & Nov⁰⁴)
3. Describe with a neat sketch the measurement of pitch of internal and external screw threads using a pitch measuring machine. (AU, Dec⁰⁹)
4. Briefly explain any one method of measurement the gear tooth thickness. (AU, Apr⁰⁸)
5. Explain the constant cord method for measuring the gear tooth thickness. (AU, June⁰⁹ & Dec⁰⁹)
6. Describe the instrument „Gear tooth Vernier caliper“. Calculate the gear tooth caliper settings to measure the chordal tooth thickness of a gear of 45 teeth having a module of 4. (AU, Dec⁰⁷)
7. Explain the principle of measuring gear tooth thickness by Base tangent method. (AU, Apr⁰⁴)
8. With the help of neat sketch explain the principle of operation of rolling gear tester. (AU, Dec⁰⁸ & Nov⁰³)
9. Explain the principle of checking involute profile of gear tooth. (AU, Nov⁰⁴ & Dec⁰⁶)
10. Explain the working principle of Tomlinson surface meter with a neat sketch. (AU, Nov⁰³ & June⁰⁹)
11. How is the straightness of straight edge measured? (AU, Dec⁰⁷)

--



**DHANALAKSHMI SRINIVASAN
COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING**

12. Define straightness. Describe any one method of measuring straightness of a surface. (AU, Nov“03)
13. Describe the stylus-type surface roughness measuring instrument. (AU, Nov“04)
14. With the help of a neat sketch, describe the construction and working of a profilometer. (AU, Nov“05)
15. Describe any one method of testing flatness of a surface plate. (AU, Nov“05)
16. Explain in detail the roundness testing machine. (AU, Dec“07)

16 Marks

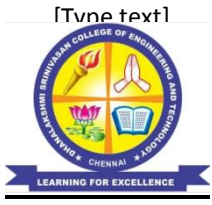
1. What do you mean by major, minor and effective diameter of a thread? (AU, Nov“06)
2. Explain the construction of a screw measuring machine and explain how it is used in measuring the minor diameter of a screw thread. (AU, June“09)
3. Draw and explain the measurement of effective diameter of a screw thread using three wires. (AU, Nov“03 & Apr“04)
4. How to measure the pitch of the screw thread by using the tool Makers Microscope? Discuss in detail. (AU, Dec“06)
5. How to check the composite errors of the gear by using Parkinson gear testing machine? Explain it in detail. (AU, Dec“06)

UNIT – IV

LASER & ADVANCES IN METROLOGY

8 Marks

1. Discuss the different types of laser light sources. (AU, Dec“07)
2. Sketch the schematics of an interferometer and explain its working. (AU, Dec“03)
3. How the displacements are measured using laser interferometer? (AU, Dec“04, Nov“05)
4. Describe the construction & working of a laser micrometer. (AU, Dec“07 & Nov“05)
5. Explain the various geometrical tests that are to be done to get a better accuracy in the machine tool? (AU, Dec“06)
6. How is pitch and yaw errors in X-axis table movement of a vertical milling machine measured? (AU, Dec“04)
7. Explain in detail the various methods of testing accuracy of lathe using laser interferometer. (AU, Dec“05)
8. Describe any one method of testing flatness of a surface plate. (AU, Dec“05).



**DHANALAKSHMI SRINIVASAN
COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING**

9. Write detailed notes on Computer Aided Inspection and discuss the needs. (AU, Dec⁰⁵, June⁰⁹ & Apr⁰⁴)
10. Describe the steps involved in measurement in CMM. (AU, Apr⁰⁴)
11. Discuss the use of computers in the field of metrology. (AU, Apr⁰⁸)
12. What are the applications of vision system in metrology? (AU, Apr⁰⁴)

16 Marks

1. Explain in detail the various methods of testing accuracy of horizontal milling machine and lathe using LASER Interferometer. (AU, Apr⁰⁴)
2. With a neat sketch, explain the working of AC LASER interferometer. (AU, Nov⁰⁵, Nov⁰⁶, Nov⁰⁷, Dec⁰⁸, Apr⁰⁸, June⁰⁹ & Apr⁰⁴)
3. Describe briefly the construction and operation of a co-ordinate measuring machine. (AU, Dec⁰³)
4. Explain the procedure to be used in measurement of various dimensions of a typical component using a cantilever type CMM. (AU, Dec⁰⁷ & Dec⁰⁸)
5. Briefly explain the calibration of three co-ordinate measuring machine with sketch and state the advantages of CMM. (AU, Apr⁰⁸)
6. List out the various probes used in CMM and explain the working principle of touch trigger probe. (AU, Dec⁰⁵, Dec⁰⁴ & Apr⁰⁴)
7. Explain the construction & working of any two types of Bridge type CMM. (AU, Dec⁰⁹ & June⁰⁹)
8. Describe in details of the function and application of Machine vision system. (AU, Nov⁰⁵)
9. Write short notes on the following: (i) CAI (ii) Applications of Machine vision. (AU, Nov⁰³)

UNIT – V

MEASUREMENT OF MECHANICAL PARAMETERS

8 Marks

1. Explain briefly any one method of torque measurement. (AU, Dec⁰⁷)
2. Briefly explain a torque meter. (AU, Apr⁰⁸)
3. Describe with neat sketches strain gauge torque meter. (AU, Dec⁰⁹)
4. Describe any one method used to measure very high pressure. (AU, Dec⁰⁸)
5. Describe the variable capacitance transducer in connection with pressure measurement. (AU, Dec⁰⁹)



**DHANALAKSHMI SRINIVASAN
COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING**

6. Describe the construction of a hydraulic dynamometer and explain how it is used for power measurement. (AU, Dec⁰³)
7. How to measure the power by using rope brake dynamometer? Explain with neat diagram. (AU, Dec⁰⁶)
8. Explain the construction & working of a Venturimeter. (AU, June⁰⁹)
9. Describe a method of orifice flow measurement using a suitable instrument. (AU, Dec⁰⁸)
10. How to use the pitot tube for flow measurement? (AU, Dec⁰⁷)
11. Rotometer – Explain in detail with sketch. (AU, Apr⁰⁷ & June⁰⁹)
12. Explain the working of bimetallic strip type temperature measurement system. (AU, Dec⁰⁷ & June⁰⁹)
13. Describe with neat sketches of Thermocouples. (AU, Dec⁰⁹ & Apr⁰⁴)
14. Explain the method of measuring temperature of a body using electrical resistance thermister. (AU, Dec⁰⁸)

16 Marks

1. Explain with the help of a neat sketch a method used for force measurement using elastic force meter. (AU, Dec⁰⁸)
2. Describe the function of a bourdon tube pressure gauge in detail. (AU, Dec⁰³)
3. Describe any four power measurement equipment. (AU, Dec⁰⁷)
4. Write a detailed note on pressure measuring systems and pressure measuring transducers. (AU, Apr⁰⁴)
5. Explain in detail about the characteristics of fluid flow and measurement of fluid velocity. (AU, Apr⁰⁴)
6. Describe any two types of flow measurement equipments. (AU, Dec⁰⁷)
7. Explain how cup and vane type anemometers are used to measure air movement. (AU, Dec⁰⁶)
8. With neat sketch explain the construction and working principle of vapour pressure thermometer. (AU, Dec⁰⁶)
9. List out different types of thermocouples and the materials used. State and explain the laws governing thermocouples and explain the temperature measuring techniques with thermocouples. (AU, Apr⁰⁸)
10. Write a detailed note on calibration of temperature measuring devices. (AU, Apr⁰⁴)