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Question Paper Code : 40831

B.E./B.Tech DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Fifth Semester

Mechanical Engineering

ME 8501 – METROLOGY AND MEASUREMENTS

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How does 'person' as a factor influence the results of a measurement?

2. Discuss the basis of selecting a standard for a particular type of measurement?

3. Write short notes on 'Ring guages'.

4. What is selective assembly?

5. What is the advantage of using polarized beam splitter over ordinary glass based beam splitter?

6. Mention about the uses of various types of probes used in CMMs.

7. List out the difficulties witnessed in the measurement of flatness of a surface.

8. Brief on the effect of stylus and skid in measurement of surface roughness.

9. What are the uses of a force transducer?

10. Define 'Reliability'.

PART B — (5 × 13 = 65 marks)

11. (a) Briefly explain the elements of a measurement system. (13)

Or

(b) Explain various types of errors that occur in engineering measurements. (13)

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12. (a) Explain the concept of interchangeability applied to industries. (13)

Or

(b) Explain various cases of application of sine bars with neat diagrams. (13)

13. (a) Explain with case studies the use of laser interferometers for linear and angular measurements. (13)

Or

(b) Describe various Industrial applications of CMMs with sketches wherever needed. (13)

14. (a) Explain the procedure for finding the chordal thickness of a gear using a gear tooth vernier caliper. (13)

Or

(b) Describe various comparison methods of surface assessment. (13)

15. (a) Explain any two types of flow meters with neat diagrams stating their advantages and disadvantages. (13)

Or

(b) With a neat sketch explain the working of electrical resistance thermometer. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Elaborate on the importance of roughness and waviness in context to various engineering applications. (15)

Or

(b) Explain the scope of machine vision in a blotting plant with suitable sketches. (15)

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Reg. No. :

Question Paper Code : X 10700

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Fifth Semester
Mechanical Engineering
ME 8501 – METROLOGY AND MEASUREMENTS
(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Distinguish Precision and Accuracy.
2. Define grass error.
3. Give the various types of linear measuring instruments.
4. Write any four precautions to be followed when using slip gauges.
5. What is meant by alignment test on Machine tools ?
6. Why the laser is used in alignment testing ?
7. What are the applications of toolmakers microscope ?
8. Define Constant Chord.
9. Write the working principle of Orifice meter.
10. List various types of temperature sensors.

PART – B **(5×13=65 Marks)**

11. a) Explain the classification of various measuring methods. **(13)**

(OR)

b) Explain the various systematic and random errors in measurements. **(13)**

12. a) With neat sketch explain the working principle of micro optic auto collimator. **(13)**

(OR)

b) Explain the following with neat sketch.

i) Sine bar ii) Bevel Protractor. **(7+6)**

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13. a) Explain the working principle of AC LASER interferometer and how the straightness is measured. **(13)**

(OR)

b) With neat sketch explain the various types of CMM based on its construction. Also write the advantages of computer aided inspection. **(13)**

14. a) Describe a gear tooth Vernier Caliper and explain its use for checking tooth thickness and depth of tooth. **(13)**

(OR)

b) Derive the formula for measuring the effective diameter of thread by 3-wire method with neat sketch. **(13)**

15. a) With neat diagram explain the construction and working principle of the following :

i) Pitot Tube ii) Venturi meter **(6+7)**

(OR)

b) With neat diagram explain the construction and working principle of the following :

i) Thermo couple ii) Bi-Metallic strip. **(7+6)**

PART – C **(1×15=15 Marks)**

16. a) Design general type GO and NO GO gauges for a 40H7/d8 fit. 40 mm lies in the diameter 30 to 50. Show graphically the disposition of gauge tolerance zones relative to tolerance zones. Standard tolerance for IT 7 is 16i and IT8 is 25i, where 'I' is the tolerance unit. The upper deviation for 'd' shaft is-$16D^{0.44}$. **(15)**

(OR)

b) An electronic caliper was used to measure the length of an object. Five measurements were made. The results of the five measurements are : 21.53 mm, 21.51 mm, 20.52 mm, 21.48 mm and 21.42 mm. The workshop temperature during measurement was 21°C. The calibration certificate of the electronic caliper says that the device will read within ± 0.02mm of the correct answer if it is used correctly and when the temperature is within 0 to 40°C. Estimate the expanded uncertainty at a coverage factor of 2 providing coverage probability of approximately 95%. **(15)**

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Reg. No. :

Question Paper Code : 90367

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fifth Semester

Mechanical Engineering

ME 8501 – METROLOGY AND MEASUREMENTS

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. What is sensitivity ?
2. What is systematic error ?
3. Why are sine bars not used for measuring large angles ?
4. Name any four instruments used for measuring internal diameters of components.
5. Why is laser preferred in engineering metrology ?
6. Name the different stages involved in the machine vision based measurement.
7. Name any four elements of gear which are checked for accuracy.
8. What is 'lead' in screw thread measurement ?
9. Mention few methods of torque measurement.
10. State the principle of hot wire anemometer.

PART – B **(5×13=65 Marks)**

11. a) Discuss metrological characteristics of Measuring Instruments. **(13)**

(OR)

b) i) What are random errors ? Discuss their characteristics.

ii) Compare line and end standards. **(6+7)**

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12. a) Discuss the construction, working principle, advantages and limitations of mechanical and pneumatic comparators. **(13)**

(OR)

b) i) Discuss the purpose of limit gauges and list the factors that must be considered in designing limit gauges.

ii) What are adjustable snap gauges and how it differs from snap gauges ? **(8+5)**

13. a) Explain the operation of AC Interferometer with the aid of block diagram and also mention its advantages. **(13)**

(OR)

b) Sketch and describe the various types of Co-ordinate Measuring Machines. **(13)**

14. a) Illustrate and explain an accurate method of measuring effective diameter of screw threads. **(13)**

(OR)

b) Explain the various methods by which roundness is measured. **(13)**

15. a) i) Illustrate the working principle for Eddy current dynamometer with neat sketch.

ii) Explain pitot tube and state its advantages and limitations. **(7+6)**

(OR)

b) Describe the working of thermistor with aid of circuit diagram. **(13)**

PART – C **(1×15=15 Marks)**

16. a) Develop a machine vision system for part sorting and bin picking operations and draw the block diagram of machine vision system. **(15)**

(OR)

b) Select a suitable measurement system for detecting changes in dimensions when components are moving and exhibit its working with schematic diagram. **(15)**

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31-5-16-AN

Question Paper Code : 57569

B.E./B. Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Mechatronics Engineering

ME 6504 – METROLOGY AND MEASUREMENTS

(Common to Materials Science and Engineering)

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What are the factors affecting the inherent characteristics of measuring instruments ?
2. Explain Line and End standards.
3. List out any four angular measuring instruments used in metrology.
4. What are the advantages of pneumatic comparator ?
5. What are the different types of geometrical tests conducted on machine tools ?
6. Write the advantages of machine vision system.
7. What is best size of wire ?
8. What are the factors affecting surface roughness ?
9. What are load cells ?
10. Mention the principle involved in bimetallic strip.

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PART – B (5 × 16 = 80 Marks)

11. (a) Explain various causes of errors.

OR

(b) Elaborate on different methods of measurement.

12. (a) Explain Johansson Microkator and Sigma Comparator with neat sketches.

OR

(b) Discuss about various types of Limit Gauges.

13. (a) Explain the working of Laser Interferometer.

OR

(b) Explain different types of CMM and their constructional features.

14. (a) Define various terminologies of screw thread with suitable diagrams.

OR

(b) Derive the expression for finding the effective diameter by three wire method.

15. (a) Discuss about any two types of measurement of temperature.

OR

(b) Explain the working of rotameter and orificemeter with neat sketches.

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19/05/17 AN

Question Paper Code : 72155

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Fourth/Fifth Semester

Mechanical Engineering

ME 6504 — METROLOGY AND MEASUREMENTS

(Common to Materials Science and Engineering/Mechatronics Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Traceability.
2. What is difference between gauging and measurements?
3. Why is rocking procedure followed when measuring with a dial bore gauge?
4. Name any four instruments used measuring internal diameters in components.
5. What is meant by "Qualifying the tip" in CMMs?
6. Write any four applications of artificial vision systems in manufacturing industries.
7. Calculate the "best size wire" for checking the effective diameter of a M10 × 2.5 thread.
8. Is assessment length greater/lesser than traverse length in surface finish measurement? Why?
9. What is meant by reliability of a measuring instrument?
10. Write the working principle of pyrometers.

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PART B — (5 × 13 = 65 marks)

11. (a) Explain the various errors in measurements.

Or

(b) What is the need of calibration? Explain the classification of various standards.

12. (a) Explain the construction and working principle of an autocollimator with a neat diagram.

Or

(b) Explain the construction, working principle and applications of Sine Bar.

13. (a) Explain the working principle of AC LASER interferometer and how the straightness is measured?

Or

(b) With neat diagram explain the working principle of tough trigger probes.

14. (a) With a neat diagram explain how gear tooth thickness is measured using a gear tooth vernier caliper.

Or

(b) Derive the expression for tooth thickness of a gear in the constant chord method.

15. (a) With neat sketches explain the construction and working principle of the following :

(i) Rotameter

(ii) Resistance thermometer. (2 × 6.5)

Or

(b) With neat diagram explain the construction and working principle of the following :

(i) Pitot tube

(ii) Bi-Metallic strip. (2 × 6.5)

PART C — (1 × 15 = 15 marks)

16. (a) Calculate the tolerances, fundamental deviations and limits of sizes for the shaft designated as 40 H8 / f7. Standard tolerance for IT 7 is 16i and IT 8 is 25i. Where 'i' is the standard tolerance unit. Upper deviation for 'f' shaft is $-5.5\,D^{0.41}$, 40 mm lies in the diameter range 30 – 50 mm .

Or

(b) Design general type GO and NO GO gauges for a 40H7/d8 fit. 40 mm lies in the diameter range 30 to 50. Show graphically the disposition of gauge tolerance zones relative to the work tolerance zones. Standard tolerance for IT7 is 16i and IT8 is 25i, where 'I' is the standard tolerance unit. The upper deviation for 'd' shaft is $-16\,D^{0.44}$.

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Question Paper Code : 41405

11/05/18 FN

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Fourth/Fifth Semester

Mechanical Engineering

ME 6504 – METROLOGY AND MEASUREMENTS

(Common to B.E. Materials Science and Engineering/Mechatronics Engineering)

(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A (10×2=20 Marks)

1. What are the factors affecting the measuring system ?
2. Distinguish between repeatability and reproducibility.
3. What are the construction requirements of a good sine bar ?
4. Define the term interchangeability.
5. Why monochromatic light is used in an interferometer instead of white light ?
6. List any four possible causes of error in CMM.
7. What is progressive error in screw thread ?
8. What is meant by back lash and run out in the spur gear ?
9. Distinguish between force and torque.
10. Name any four instruments used for measuring temperature.

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PART – B (5×13=65 Marks)

11. a) Draw the block diagram of generalized measurement system and explain the different stages with examples. (13)

(OR)

b) i) Explain the different types of errors involved in the measurement system. (7)

ii) Discuss about the primary and secondary calibration of the measuring instruments. (6)

12. a) i) Explain with suitable sketches the measurement of straightness using autocollimator. (7)

ii) Describe the GO and NOGO gauge design procedure with a sketch. (6)

(OR)

b) i) Explain the construction and working principle of bevel protector with sketch. (7)

ii) Why sine bar is not suitable to measure above 45° ? (6)

13. a) i) Explain the procedure of dimensional measurement using scanning laser gauge. (7)

ii) What are the various types of CMM's, give details about anyone with a sketch ? (6)

(OR)

b) i) Discuss the working principle of the NPL Flatness interferometer. (7)

ii) Illustrate the basic concept involved in the machine vision system. (6)

14. a) Briefly explain the step by step procedure for determining the flatness of a surface with the neat sketch. (13)

(OR)

b) i) Explain the thread micrometer with a neat sketch. (7)

ii) What are the various gear tooth measuring methods ? Explain any one with simple sketch. (6)

15. a) i) With a sketch, explain the torque measurement using strain gauges. (6)

ii) Describe the construction of a hydraulic dynamometer and explain how it is used for power measurement. (7)

(OR)

b) With a neat sketch explain the velocity measurement using hot wire anemometer. (13)

PART – C (1×15=15 Marks)

16. a) Measure the angle of inclination in the part using the rollers with the following method, among that identify which method produce the accuracy in the measurement.

i) Measurement of angle using rollers.

ii) Checking the angle of taper plug gauges using rollers.

iii) Measuring of inclind angle of an internal dovetail.

iv) Measuring interior angle using of a profile gauge.

b) Describe the following direct instrument measurements.

i) Stylus probe type instrument.

ii) Tomlinson surface meter.

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OFFICE OF EXAMCELL * CHENNAI 600 130 * AGNI COLLEGE OF TECHNOLOGY

Question Paper Code : 53311

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth/Fifth Semester

Mechanical Engineering

ME 6504 — METROLOGY AND MEASUREMENTS

(Common to Materials Science and Engineering, Mechatronics Engineering)

(Regulation 2013)

(Also common to PTME 6504 — Metrology and Measurements for B.E. Part-Time — Fourth Semester — Mechanical Engineering — Regulation 2014)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Traceability.
2. What is difference between gauging and measurements?
3. Write short notes on Bevel Protractor.
4. Write short notes on interchangeability.
5. On what factor the accuracy of laser interferometer mainly depends?
6. List any three field applications of machine vision system.
7. Define "material ratio" with reference to surface finish measurement.
8. How is roundness measured in the Least squares circle method?
9. What are load cells?
10. Mention the principle involved in bimetallic strip.

PART B — (5 × 13 = 65 marks)

11. (a) Classify standard methods of measurements in detail. (13)

Or

(b) What are the various possible sources of error in measurements ? Explain in detail. (13)

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12. (a) Discuss about various types of Limit Gauges.

Or

(b) Explain the construction and working of a Microptic autocollinator with a neat sketch.

13. (a) (i) With a neat diagram explain the working of AC laser interferometer. (8)

(ii) List the advantages of AC laser interferometer. (5)

Or

(b) (i) With neat sketch briefly explain the different types of CMM based on its construction. (10)

(ii) List out the advantages of CMM. (3)

14. (a) With a neat diagram explain how gear tooth thickness is measured using a gear tooth vernier caliper.

Or

(b) Derive the expression for tooth thickness of a gear in the constant chord method.

15. (a) With neat diagrams explain the working principle of rotameter and pitot tube.

Or

(b) With a neat diagram explain the working of bimetallic strip and thermocouple.

PART C — (1 × 15 = 15 marks)

16. (a) Calculate the tolerances, fundamental deviations and limits of sizes for the shaft designated as 40 H8/ f7. Standard tolerance for IT 7 is 16 i and IT 8 is 25 i. Where 'i' is the standard tolerance unit. Upper deviation for 'f' shaft is $-5.5D^{0.41}$, 40 mm lies in the diameter range 30 – 50 mm.

Or

(b) Design general type GO and NO GO gauges for a 40H7/ d8 fit. 40 mm lies in the diameter range 30 to 50. Show graphically the disposition of gauge tolerance zones relative to the work tolerance zones. Standard tolerance for IT7 is 16i and IT8 is 25i, where 'i' is the standard tolerance unit. The upper deviation for 'd' shaft is $-16D^{0.44}$.

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MECH 8/11/16 F.N

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Question Paper Code : 80664

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fifth Semester

Mechanical Engineering

ME 6504 — METROLOGY AND MEASUREMENTS

(Common to Fourth Semester Mechatronics Engineering and Materials Science and Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Brief on sensitivity in measurement.

2. Differentiate between accuracy and precision.

3. Write short notes on Bevel Protractor.

4. Write short notes on interchangeability.

5. Why laser is used as light source in interferometers?

6. Name the different stages involved in the machine vision based measurement.

7. Define drunken thread.

8. What are the various factors affecting surface roughness of a machined component?

9. Give the principle of hot wire anemometer.

10. Name the materials used for thermocouples.

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PART B — (5 × 16 = 80 marks)

11. (a) With a suitable example explain the various elements of generalised measurement system. (16)

Or

(b) Describe the different types of errors and its causes. (16)

12. (a) Discuss in detail about the various types of limit gauges with neat diagram. (16)

Or

(b) (i) Explain the working principle of angle dekker with a neat sketch. (10)

(ii) Write its advantages. (6)

13. (a) (i) With a neat diagram explain the working of AC laser interferometer. (10)

(ii) List the advantages of AC laser interferometer. (6)

Or

(b) (i) With neat sketch briefly explain the different types of CMM based on its construction. (8)

(ii) List out the advantages of CMM. (8)

14. (a) Describe the construction of gear tooth verniercaliper. Explain how it can be used for measuring the tooth thickness. (16)

Or

(b) Enlist and explain the different methods used for measuring the roundness. (16)

15. (a) (i) Explain the working of rotameter in flow measurement. (8)

(ii) Discuss the working principle of bourdan tube pressure gauge. (8)

Or

(b) (i) Draw the construction of electrical resistance thermometer. Explain how it can be used for temperature measurement. (8)

(ii) With a neat diagram, discuss the working of liquid in glass thermometer. (8)

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Reg. No. :

Question Paper Code : 50874

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Fourth/Fifth Semester
Mechanical Engineering
ME 6504 – METROLOGY AND MEASUREMENTS
(Regulations 2013)
(Common to Materials Science and Engineering/ Mechatronics Engineering)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. What is the difference between correction and correction factor ?
2. Define Parasitic and illegitimate error.
3. What is the use of Feeler gauges ?
4. A vernier scale consists of 25 divisions on 12 mm spacing and the main scale has 24 divisions on 12 mm. What is the least count ?
5. On what factor the accuracy of laser interferometer mainly depends ?
6. List any three field applications of machine vision system.
7. How is surface roughness assessed ?
8. List out the sources of Out-of-Roundness.
9. Write the working principle of hot wire Anemometer.
10. What is the working principle of thermocouple ?

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PART – B (5×13=65 Marks)

11. a) Classify standard methods of measurements in detail. (13)

(OR)

b) What are the various possible sources of error in measurements ? Explain in detail. (13)

12. a) i) How slip gauges are manufactured ? (5)

ii) Explain the construction and working principle of angle dekkor with a neat diagram. (8)

(OR)

b) Explain with a neat sketches, the principle and working of an autocollimators and also list its applications. (13)

13. a) Explain different types of CMM, in detail. (13)

(OR)

b) Explain the working principle of a AC laser interferometer with a neat diagram. (13)

14. a) Explain how a gear can be checked using Parkinson Gear Tester also mentions its limitations. (13)

(OR)

b) With a neat sketch explain the working principle of Tomlinson Surface finish tester. (13)

15. a) Explain the construction and working principle of any two instruments used for measuring temperature. (13)

(OR)

b) Explain the construction and working of Venturimeter and Rotameter. (13)

PART – C (1×15=15 Marks)

16. a) A machine vision system recovers useful information about a scene from its two dimensional digitized image. What are the stages in machine vision process ?

(OR)

b) Design a workshop type progressive type Go-Not-Go plug gauge suitable for 25 H7, with following information :

i) 25 mm lies in the diameter step of 18-30 mm.

ii) $i = 0.45 \sqrt[3]{D} + 0.001D$

iii) IT7 = 16i.

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Question Paper Code : 20815

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Fourth/Fifth Semester

Mechanical Engineering

ME 6504 — METROLOGY AND MEASUREMENTS

(Common to : Materials Science and Engineering/Mechatronics Engineering)

(Regulations 2013)

(Also common to : PTME 6504 – Metrology and Measurements for B.E. (Part-Time) Fourth Semester – Mechanical Engineering – Regulations – 2014)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the important elements of measurement?

2. Define sensitivity.

3. How do you find the least count of a micrometer?

4. What are the limitations of sine bar?

5. Name the types of laser.

6. How are CMM classified on the basis of configuration?

7. What is 'best wire size' in screw thread measurement?

8. Name any four elements of gear which are checked for accuracy.

9. What are torque meters?

10. State the various types of commercially available thermocouples.

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PART B — (5 × 13 = 65 marks)

11. (a) (i) Describe the types of measurement.

(ii) Differentiate between Precision and accuracy. (7 + 6)

Or

(b) (i) What are the sources of errors? How are they classified?

(ii) Write short notes on types of standards. (7 + 6)

12. (a) Discuss the construction, working principle, and applications of any one angular displacement measuring instrument. (13)

Or

(b) Describe the working principle of Auto Collimeter with neat diagram. (13)

13. (a) (i) With the aid of sketches describe the laser telemetry system.

(ii) Briefly explain principle of laser triangulation sensor. (7 + 6)

Or

(b) (i) Discuss the construction and working of bridge type CMM.

(ii) Enumerate the role of computers in Metrology. (7 + 6)

14. (a) (i) Illustrate with neat sketch the functioning of surface finish measurement system.

(ii) Discuss the various elements of surface roughness. (7 + 6)

Or

(b) Name the methods of measuring gear tooth thickness and explain any one in detail. (13)

15. (a) (i) Describe the force measurement using hydraulic load cell.

(ii) Summarize the relative merits of Venturi, Flow Nozzle and Orifice. (7 + 6)

Or

(b) (i) Sketch and describe the elementary thermocouple circuit.

(ii) What is rotameter? Discuss its significance. (7 + 6)

PART C — (1 × 15 = 15 marks)

16. (a) Design the general type GO and NO-GO gauge for the components having 20H7f8 fit. Given :

(i) 'i' (micron) = $0.45\ (D)^{1/3} + 0.001\ D$

(ii) Upper deviation of 'f' shaft = $-5.5\ D^{0.41}$

(iii) 20 mm fall in the diameter step of 18 mm to 30 mm.

(iv) IT7 = 16i

(v) IT8 = 25i

(vi) Wear allowance 10% of gauge tolerance. (15)

Or

(b) Select a suitable autocollimator for checking angular indexing and for small linear displacements and illustrate its working with schematic diagram. (15)

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Reg. No. :

Question Paper Code : 91846

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fourth/Fifth Semester

Mechanical Engineering

ME 6504 : METROLOGY AND MEASUREMENTS

(Common to Materials Science and Engineering/Mechatronics Engineering)

(Regulations 2013)

(Also Common to PTME 6504 – Metrology and Measurements for B.E. (Part-Time)Fourth Semester – Mechanical Engineering – Regulations 2014)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. What are the factors affecting the inherent characteristics of measuring instruments ?
2. Define Line and End standards.
3. Write any two precautions to be followed when using gauge blocks.
4. Why are sine bars used in metrology ?
5. Why laser is used as light source in interferometers ?
6. Name the different stages involved in the machine vision based measurement.
7. How is surface roughness assessed ?
8. What are the causes of roundness errors ?
9. What is meant by reliability of a measuring instrument.
10. Write the working principle of pyrometers.

PART – B **(5×13=65 Marks)**

11. a) What are the various elements of metrology ? With examples, explain how these elements influence the accuracy of measurements ?

(OR)

b) Explain with neat diagrams the method for measurement of straightness of a machine tool guide way using an Autocollimator. Show the tabulation to determine the error in straightness by choosing a reference line passing through the first and last points of the guide way.

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12. a) Discuss in detail about the various types of limit gauges with neat diagram.

(OR)

b) i) Explain the working principle of angle dekker with a neat sketch.

ii) Write its advantages.

13. a) Explain the working of Laser Interferometer.

(OR)

b) Explain different types of CMM and their constructional features.

14. a) Explain how a gear can be checked using Parkinson Gear Tester also mentions its limitations.

(OR)

b) With a neat sketch explain the working principle of Tomlinson Surface finish tester.

15. a) With neat sketches explain the construction and working principle of the following :

i) Rotameter.

ii) Resistance thermometer.

(OR)

b) With neat diagram explain the construction and working principle of the following :

i) Pitot tube.

ii) Bi-Metallic strip.

PART – C **(1×15=15 Marks).**

16. a) A machine vision system recovers useful information about a scene from its two dimensional digitized image. Explain the stages in machine vision process ?

(OR)

b) Design a workshop type progressive type Go-Not-Go plug gauge suitable for 25 H7, with following information.

i) 25 mm lies in the diameter step of 18-30 mm.

ii) $i = 0.45 \sqrt[3]{D} + 0.001D$

iii) $IT7 = 16i$.

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