Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

SIXTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

**Course Code: ME312**

**Course Name: METROLOGY AND INSTRUMENTATION (ME, MP, PE)**

Max. Marks: 100 Duration: 3 Hours

***Use of approved Data book permitted.***

**PART A**

***Answer any three full questions, each carries 10 marks.*** Marks

1 a) Explain the process of wringing of slip gauges. (4)

b) What is sine bar? How sine bars are used for angle measurement? (6)

2 a) Explain the construction and uses of Vernier Bevel Protractor. (5)

b) With neat sketches explain the method of measuring angles using Angle Dekkor. (5)

3 a) Explain with suitable examples how holes, shafts and fits are designated? (4)

b) Define the following terms:- (6)

(i) Allowance.
(ii) Tolerance.
(iii) Limits.

4 a) Sketch and describe the optical arrangement of N.P.L. Flatness Interferometer. (6)

b) State and explain Taylor's Principle of Gauge Design. (4)

**PART B**

***Answer any three full questions, each carries 10 marks.***

5 a) Define the following terms used in screw thread:-

(i) Pitch
(ii) Lead
(iii) Major Diameter
(iv) Minor Diameter
(v) Pitch Diameter (5)

b) Explain with neat sketches the method used for measuring the major diameter of screw thread. (5)

6 a) Define the following terms in surface texture measurements:-

(i) Primary Texture.
(ii) Secondary Texture.
(iii) Lay. (4)

(iv) Sampling Length.

b) Describe the method of evaluating roughness using

(i) Peak to valley high method.
(ii) C.L.A. method. (6)

7 a) With neat sketches explain the working principle of Laser Interferometer. (6)

b) Discuss the different types of probes used in CMM. (4)

8 a) Explain the various steps in machine vision system. (6)

b) List the advantages and applications of CMM. (4)

## PART C

***Answer any four full questions, each carries 10 marks.***

9 a) Explain the dynamic characteristics of a measuring instrument. (6)

b) Define the following terms used in measuring devices:-

(i) Drift.
(ii) Threshold. (4)
(iii) Hysteresis.
(iv) Span.

10 a) Discuss how measuring instruments are classified? (4)

b) Define sensors. How sensors are classified? (6)

11 With neat sketches explain the construction and working of LVDT. List the advantages and applications of LVDT. (10)

12 a) With sketches explain the working of Electrical Dynamometer. (6)

b) Define thermocouple. List its advantages and disadvantages. (4)

13 a) Explain the working principle of Pneumatic load cell with neat sketches. (5)

b) How temperature is measured by using bimetallic strip thermometer? (5)

14 a) Explain the construction and working of RTD. (5)

b) With sketches explain measurement of vibration using accelerometers. (5)

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Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

**Course Code: ME312**

**Course Name: METROLOGY AND INSTRUMENTATION**

Max. Marks: 100 Duration: 3 Hours

**PART A**

***Answer any three full questions, each carries 10 marks.*** Marks

| | | | |
|---|---|---|---|
| 1 | a) | List out the various elements of measurement. | (3 ) |
| | b) | What is ABBE's Principle? | (3 ) |
| | c) | Distinguish between accuracy and precision of an instrument? | (4 ) |
| 2 | a) | Explain line standard and end standard measurement | ( 4) |
| | b) | Distinguish between limits and tolerance. | ( 3) |
| | c) | What is Taylor's principle of gauging? | (3 ) |
| 3 | a) | Explain any two types of Limit plug gauges | ( 4) |
| | b) | Explain the working of Sigma comparator with a neat sketch | ( 4) |
| | c) | List the advantages of pneumatic comparator? | ( 2) |
| 4 | a) | Explain the working of a NPL flatness interferometer. | (4) |
| | b) | Distinguish between hole basis system and shaft basis system | (2 ) |
| | c) | With neat sketches explain the difference between clearance fit and interference fit? | ( 4) |

**PART B**

***Answer any three full questions, each carries 10 marks.***

| | | | |
|---|---|---|---|
| 5 | a) | Describe any three terms associated with a screw thread. | (3) |
| | b) | Differentiate between surface roughness and waviness? | (3) |
| | c) | List out the various methods to measure surface roughness. | (4) |
| 6 | a) | What is meant by sampling length? | (2) |
| | b) | What is a CMM probe? Explain the various types of probes used in CMM | (5) |
| | c) | List out the application of Machine vision system? | (3) |
| 7 | a) | Differentiate between the Type A and the Type B optical flats | (2) |
| | b) | With a neat sketch explain the machine vision system | (4) |

| | | | |
|---|---|---|---|
| | c) | With neat sketches explain Bridge type CMM and Cantilever type CMM | (4) |
| 8 | a) | Explain three wire method of the screw thread measurement? | (4) |
| | b) | Explain the measurement of the flank angle using the profile projector and the microscope? | (3) |
| | c) | Explain the working of the Tomlinson surface meter. | (3) |

## PART C

***Answer any four full questions, each carries 10 marks.***

| | | | |
|---|---|---|---|
| 9 | a) | Give any four classifications of the measuring instruments. | (4) |
| | b) | Explain the static characteristics of measuring instruments. | (4) |
| | c) | Differentiate between the active and passive transducers. | (2) |
| 10 | a) | With suitable examples explain the fidelity and the measuring lag. | (3) |
| | b) | How will you assess the sensitivity of an instrument? | (3) |
| | c) | What is the combined sine and cosine error in measurement? | (4) |
| 11 | a) | List out any four classifications of a transducer. | (4) |
| | b) | Explain the working of hydraulic load cell | (3) |
| | c) | List the advantages and limitations of LVDT | ( 3) |
| 12 | a) | Explain the method of measuring strain by using strain gauges. | (3) |
| | b) | Explain the three component force measurement using piezoelectric quartz crystal. | (4) |
| | c) | Explain the method of measuring torque by using a mechanical dynamo meter. | ( 3) |
| 13 | a) | Explain the basic principle and operation of a vibro-meter. | (4) |
| | b) | What is a pressure thermometer? | ( 3) |
| | c) | Explain the working of liquid in glass thermometer. | ( 3) |
| 14 | a) | Explain the measurement of Thermocouple EMF. | (3) |
| | b) | List out any four thermocouple materials. | (4) |
| | c) | What is a resistance temperature detector (RTD)? | (3) |

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Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

**Course Code: ME312**

**Course Name: METROLOGY AND INSTRUMENTATION**

Max. Marks: 100 Duration: 3 Hours

**PART A**

***Answer any three full questions, each carries 10 marks.***

| | | | Marks |
|---|---|---|---|
| 1 | a) | Why do we go for highly precise measuring instruments? | (3 ) |
| | b) | What is meant by calibration and precision of an instrument? | (3 ) |
| | c) | Differentiate between the line standards and the end standards. | (4 ) |
| 2 | a) | What is the advantage of using the wavelength standard? | ( 3) |
| | b) | What is meant by wringing of slip gauges? | ( 3) |
| | c) | Explain how Sine bar is used for measurement of small size component and large size component | (4 ) |
| 3 | a) | With a neat sketch explain Johansson Mikrokator. | ( 4) |
| | b) | Explain the working of a laser interferometer | ( 3) |
| | c) | What is meant by the hole basis system and the shaft basis system. | ( 3) |
| 4 | a) | Write the difference between inspection gauges and workshop gauges? | (3) |
| | b) | Differentiate between clearance fit and interference fit. | (3 ) |
| | c) | What is meant by work tolerance and gauge tolerance? | ( 4) |

**PART B**

***Answer any three full questions, each carries 10 marks.***

| | | | |
|---|---|---|---|
| 5 | a) | Explain the measurement of effective diameter of a screw thread with two wire method. | (3) |
| | b) | Explain the measurement of flank angle by profile projector. | (3) |
| | c) | What is the meaning of surface texture, roughness and waviness? | (4) |
| 6 | a) | What is Ra, Rt and Rz values in surface roughness? | (3) |
| | b) | With a neat sketch explain the working of a Talysurf. | (3) |
| | c) | With a neat sketch explain the working of an autocollimator. | (4) |
| 7 | a) | Explain the alignment testing of a drilling machine. | (3) |
| | b) | Explain the components and construction of a Co-ordinate Measuring Machine. | (4) |

| | | | |
|---|---|---|---|
| | c) | Explain any four applications of the Co-ordinate Measuring Machine. | (3) |
| 8 | a) | Differentiate between contact probes and non-contact probes. | (3) |
| | b) | Explain any three applications of a machine vision system. | (3) |
| | c) | Explain the steps in machine vision. | (4) |

## PART C

***Answer any four full questions, each carries 10 marks.***

| | | | |
|---|---|---|---|
| 9 | a) | What is the significance of mechanical measurement? | (3) |
| | b) | Explain any four methods of measurement. | (4) |
| | c) | Explain the various stages in a generalized measuring system. | (3) |
| 10 | a) | Explain the terms repeatability and sensitivity. | (3) |
| | b) | Explain the static characteristics of a measuring instrument. | (4) |
| | c) | How will you quantify parallax error in measurement? | (3) |
| 11 | a) | Explain any three dynamic error of an instrument. | (3) |
| | b) | What is LVDT and mention the advantages of LVDT | (4) |
| | c) | Explain any three classifications of a transducer. | ( 3) |
| 12 | a) | Explain the working of an electrical resistance strain gauge. | (3) |
| | b) | How the three component force measurement is carried out by using a piezoelectric quartz crystal. | (4) |
| | c) | Explain the different types of strain gauges | ( 3) |
| 13 | a) | Explain the basic principle of hydraulic load cell. | (3) |
| | b) | How the torque measurement is carried out by a rope brake dynamometer. | ( 3) |
| | c) | Explain how vibration is measured by using an accelerometer. | ( 4) |
| 14 | a) | What is radiation pyrometer | (4) |
| | b) | List out any two advantages of thermocouple over thermometer. | (3) |
| | c) | What is a thermistor? | (3) |

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Reg No.:_____ Name:_____

**03000ME312052002**

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Sixth semester B.Tech degree examinations (S), September 2020

**Course Code: ME312**

**Course Name: METROLOGY AND INSTRUMENTATION**

Max. Marks: 100 Duration: 3 Hours

**PART A**

***Answer any three full questions, each carries 10 marks.*** Marks

| | | | |
|---|---|---|---|
| 1 | a) | Distinguish between relative error and random error. | (4) |
| | b) | Explain how the measurements are made with universal bevel protractor. | (4) |
| | c) | Write any two precautions to be followed when using a gauge block. | (2) |
| 2 | a) | Explain briefly the construction and working of a height gauge. | (5) |
| | b) | Explain with the help of a diagram the principle of a sine bar. | (5) |
| 3 | a) | Differentiate hole basis and shaft basis systems of tolerance, which system is used most and why? | (6) |
| | b) | Explain the following gauges (1) snap gauges (2) plug gauges | (4) |
| 4 | a) | Write any four characteristics of Laser. | (4) |
| | b) | Describe the working of optical flat with neat sketch. | (4) |
| | c) | State the principle of interferometry. | (2) |

**PART B**

***Answer any three full questions, each carries 10 marks.***

| | | | |
|---|---|---|---|
| 5 | a) | Discuss the procedure involved in a profile projector to project the images. | (4) |
| | b) | Explain the measurement of major and minor diameters of a screw thread. | (6) |
| 6 | a) | With the help of a neat sketch describe the working of a profilometer. | (5) |
| | b) | Explain the principle and working of Autocollimator. | (5) |
| 7 | a) | Discuss any two alignment tests carried out in lathe machine with neat sketch. | (6) |
| | b) | List the various geometrical checks made on machine tools | (4) |
| 8 | a) | What are the four basic steps of machine vision system? Explain any one. | (4) |
| | b) | Explain the construction and principle of CMM. | (4) |
| | c) | Mention the disadvantages of CMM. | (2) |

## PART C

***Answer any four full questions, each carries 10 marks.***

| | | | |
|---|---|---|---|
| 9 | a) | With suitable example explain the elements of generalized measurement system. | (6) |
| | b) | Write short notes on accuracy and precision with examples. | (4) |
| 10 | a) | Explain first-order system with suitable examples. | (4) |
| | b) | Write short notes on signal conditioning stage. | (3) |
| | c) | State the dynamic characteristics of simplified measuring system. | (3) |
| 11 | a) | Describe with neat sketch working of LVDT. | (6 ) |
| | b) | Give the classifications of measuring instruments. | (4) |
| 12 | a) | With neat sketch explain the working principle of pneumatic load cell. | (4) |
| | b) | Write short notes on accelerometers. | (3) |
| | c) | What are the factors to be considered for bonded strain gauge? | (3) |
| 13 | a) | Explain with neat diagram how to measure the power by using rope brake dynamometer. | (5) |
| | b) | Explain the construction of a thermocouple. | (3) |
| | c) | What are the advantages of resistance temperature detectors (RTDs)? | (2) |
| 14 | a) | Briefly explain the calibration of temperature measuring devices. | (4) |
| | b) | Explain the working of pressure thermometer. | (4) |
| | c) | What is the principle of radiation pyrometer? | (2) |

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