Printed Page:-03 **Subject Code:- BME0403**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech (ME-Working Professional)

SEM: II - THEORY EXAMINATION (2024 - 2025)

Subject: Measurement and Metrology

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

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SECTION-A 20

1. Attempt all parts:-

1-a. What does standardization in metrology ensure?(CO1,K1) 1

(a) Variable measurements
(b) Uniformity in measurement
(c) Approximate measurements
(d) None of the above

1-b. What is meant by interchangeability in manufacturing?(CO1,K1) 1

(a) Unique components for every assembly
(b) Standardized parts fit into any assembly
(c) Custom manufacturing for each product
(d) Only one product can be assembled

1-c. Straightness is a type of:(CO2,K1) 1

(a) Form tolerance
(b) Location tolerance
(c) Orientation tolerance
(d) Profile tolerance

1-d. Which of the following is NOT a primary type of Geometric Dimensioning and Tolerancing (GD&T) control? (CO2,K1) 1

(a) Form
(b) Location

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(c) Run-out

(d) Fit

1-e. What does CMM stand for?(CO3,K1) 1

(a) Coordinate Measuring Machine

(b) Central Measurement Mechanism

(c) Calibration Measurement Machine

(d) Constant Measuring Machine

1-f. What type of sensors are commonly used in CMM probes?(CO3,K1) 1

(a) Infrared sensors

(b) Optical sensors

(c) Piezoelectric sensors

(d) Thermal sensors

1-g. Which metrology technique is used in 3D measurement?(CO4,K1) 1

(a) Coordinate Measuring Machines (CMM)

(b) Micrometers

(c) Linear scales

(d) Standard gauges

1-h. In which field is laser vision commonly applied?(CO4,K1) 1

(a) Food packaging

(b) Precision metrology

(c) Carpentry

(d) Textile manufacturing

1-i. Which of the following is a key function of software metrology?(CO5,K1) 1

(a) Cutting materials

(b) Processing measurement data

(c) Controlling temperature

(d) Managing inventory

1-j. Which type of laser is typically used in metrology for high-precision measurements?(CO5,K1) 1

(a) CO2 laser

(b) Helium-Neon laser

(c) Excimer laser

(d) Ultraviolet laser

2. Attempt all parts:-

2.a. Define limit gauging.(CO1,K1) 2

2.b. List four types of form tolerances in GD&T.(CO2,K1) 2

2.c. Name any two types of CMMs.(CO3,K1) 2

2.d. Define the term 'optical system' in metrology.(CO4,K1) 2

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2.e.	Define Computer Aided Metrology.(CO5,K1)	2
SECTION-B		30
3. Answer any five of the following:-		
3.a.	Discuss the importance of tolerances in mechanical design.(CO1,K2)	6
3.b.	What are the different types of limit gauges used in metrology? (CO1,K1)	6
3.c.	What are the applications of dimensional inspection in manufacturing?(CO2,K1)	6
3.d.	What instruments are used for surface quality inspection?(CO2,K1)	6
3.e.	Describe the construction of a touch trigger probe. (CO3,K2)	6
3.f.	How does in-process gauging contribute to manufacturing and quality control? Explai with a suitable examples.(CO4,K1)	6
3.g.	Describe the working of a laser scanner in metrology.(CO5,K2)	6
SECTION-C		50
4. Answer any one of the following:-		
4-a.	Discuss the principles of interchangeability and selective assembly with examples.(CO1,K2)	10
4-b.	Describe various inspection methods used in metrology.(CO1,K2)	10
5. Answer any one of the following:-		
5-a.	Explain the methods used for inspecting straightness.(CO2,K3)	10
5-b.	How does geometric dimensioning help in reducing machining errors?(CO2,K1)	10
6. Answer any one of the following:-		
6-a.	Explain the working principle of measuring machines.(CO3,K3)	10
6-b.	Describe the different types of CMMs and their applications.(CO3,K2)	10
7. Answer any one of the following:-		
7-a.	Explain in detail the role of CNC systems in advanced metrology and their advantages.(CO4,K3)	10
7-b.	Describe the principle, working, and applications of laser vision in industrial metrology.(CO4,K2)	10
8. Answer any one of the following:-		
8-a.	Describe in detail the working principle and applications of laser metrology.(CO5,K2)	10
8-b.	How does image processing enhance accuracy and efficiency in metrology?(CO5,K1)	10

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