Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination Dec-2023

ME3EL17 Advance Metrology

Programme: B.Tech. Branch/Specialisation: ME

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. In a measurement, what is the term used to specify the closeness of two or more measurements? **1**

(a) Precision (b) Accuracy (c) Threshold (d) None of these

ii. When tolerance is given on one side of the basic dimension, it is called- **1**

(a) Bilateral tolerance

(b) Unilateral tolerance

(c) Allowance

(d) None of these

iii. Which of the following is a contact type of automated inspection method? **1**

(a) Inspection probe (b) Laser scanning

(c) Electric field (d) All of these

iv. Which of the following is true about probes used in automatic inspection machines? **1**

(a) Retractable type

(b) Non-retractable type

(c) Auxiliary probe is not used

(d) Heads of probes are not held back till the part is in gauging position

v. Which of the following is the best for the examination of surface finish? **1**

(a) Touch inspection

(b) Visual inspection

(c) Scratch inspection

(d) Microscopic inspection

vi. Which of the following is true about the self-diagnostic system present in automatic inspection machines? **1**
(a) Increase downtime
(b) Easy but slow identification
(c) Improved efficiency of maintenance
(d) Increase settling time

vii. Which mechanism is used in CMM? **1**
(a) Sensing mechanism
(b) Contact mechanism
(c) Planning mechanism
(d) Process mechanism

viii. Which type of CMM is most suited for large heavy workpieces? **1**
(a) Cantilever type
(b) Bridge type
(c) Horizontal boring mill type
(d) Floating bridge type

ix. Which of the following is necessary for the complete study of surface roughness? **1**
(a) Measurement of all the components of elements
(b) Analysis of all the component element
(c) Assessment of the effects of combined texture
(d) Measurement and analysis of all the components and assessment of combined texture

x. Which of these is not a part of feedback control? **1**
(a) Engineering control (b) Automatic control
(c) Acceptance sampling (d) Routine adjustment

Q.2 i. Define precision and accuracy. **2**
ii. Explain uncertainty in measurements. **3**
iii. What are the different errors encountered in measurements? Explain with suitable examples. **5**
OR iv. What is tolerance? Explain different types of tolerances. **5**

Q.3 i. Explain software metrology with example. **4**
ii. Explain the difference between contact and non-contact type measurement system. **6**
OR iii. Explain Atomic Force Microscopes (AFM) with neat sketch. **6**

Q.4 Attempt any two:
i. Explain the working principle of laser interferometer with the help of neat diagram. **5**
ii. Explain surface topography. What are the four main characteristics of surface texture? **5**
iii. Explain straightness and flatness measurements. **5**

Q.5 i. What are the benefits of using CMM? **4**
ii. What is CMM? Explain any two types of CMM with the help of neat sketch. **6**
OR iii. Explain the working principle of non-contact sensors for surface finish measurements with the help of neat sketch. **6**

Q.6 Attempt any two:
i. What is normalization? Explain types of normalization. **5**
ii. What is automated visual inspection? Explain with example. **5**
iii. What is quality control? Explain on-line feedback quality control. **5**

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Marking Scheme

ME3EL17 (T)-Advance Metrology

Q.1	i)	b) accuracy		**1**
	ii)	b) unilateral tolerance		**1**
	iii)	a) Inspection probe		**1**
	iv)	a) Retractable type		**1**
	v)	d) microscopic inspection		**1**
	vi)	c) Improved efficiency of maintenance		**1**
	vii)	b) contact mechanism		**1**
	viii)	c) Horizontal boring mill type		**1**
	ix)	d) measurement and analysis of all the components and assessment of combined texture		**1**
	x)	c) acceptance sampling		**1**
Q.2	i.	Definition precision and accuracy each	1 mark	**2**
	ii.	Explain uncertainty		**3**
	iii.	Different types of errors		**5**
OR	iv.	Definition tolerance	1 marks	**5**
		Explain Types of tolerance	4 marks	
Q.3	i.	Explain software metrology with example.		**4**
	ii.	6 differences each	1 mark	**6**
OR	iii.	Atomic Force Microscopes	5 marks	**6**
		Diagram	1 marks	
Q.4	i.	Working principle	4 marks	**5**
		Diagram	1 marks	
	ii.	Surface Topography	3 marks	**5**
		four main characteristics of surface texture.	2 marks	
OR	iii.	Working principle	4 marks	**5**
		Diagram	1 marks	
Q.5	i.	benefits of using CMM		**4**
	ii.	Explain CMM	2 marks	**6**
		two types of CMM	4 marks	
OR	iii.	working principle	5 marks	**6**
		neat sketch	1 mark	
Q.6	i.	Definition normalization	2 marks	**5**
		Explain types of normalization	3 marks	
	ii.	automated visual inspection explain with example		**5**
	iii.	Definition quality control	2 marks	**5**
		Explain On-line feedback quality control	3 marks	

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