Reg. No. | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2023

Fifth Semester

ME18501 – METROLOGY AND QUALITY CONTROL

(Mechanical Engineering)

(Regulation 2018)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Students will have the ability to select the suitable mechanical measuring instruments for linear and angular measurements and calibrate them to improve the accuracy	3
CO 2	Students can acquire the knowledge on form measurements with effective 82 communication for engineering applications.	3
CO 3	Students can acquire the knowledge on advanced measuring devices and their applications for dimensional and form measurements.	3
CO 4	Students will have the ability to select the suitable instruments to measure the different process parameters like pressure, temperature and force	3
CO 5	Students will have the ability to apply the different quality principles and sampling techniques to ensure the quality of the products.	3

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	A linear measuring instrument reads 5.76 mm against a true value of 5.80 mm. Find the error in the instrument.	1	3
2.	Height of a specimen is to be measured. Suggest a suitable measuring instrument.	1	3
3.	Find the meaning for the following symbol related to surface roughness as shown in fig.1.  Fig. 1	2	3
4.	Module of a spur gear is 3 mm. find the outer diameter of the gear, if the number of teeth in the gear is 20.	2	3
5.	Brief the principle of interferometry.	3	2
6.	List the components of a machine vision system.	3	2
7.	Torque of 100 Nm is applied on a shaft with diameter of 50 mm. Find the force acting on it.	4	3
8.	List the limitations of thermocouple.	4	3
9.	Does quality has a time dimension? Brief.	5	2
10.	List the statistical process control techniques.	5	2

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PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Production of 50 mm shaft and hole pair of H_7d_8 is to be initiated. The following assumptions may be made: 50 mm lies in diameter steps of 30 and 50mm. Upper deviation for 'd' shaft is given by $-16D^{0.44}$. Lower deviation of the hole is zero. Tolerance factor $i=0.45\sqrt[3]{D}+0.001D$. IT7=6i & IT8=25i. Calculate the limits of tolerance and allowance for this hole-based system.	(14)	1	3
	(OR)			
(b)	Calculate the limits of tolerance and allowance for a 25 mm shaft and hole pair designated as H_8d_9. The following assumptions are to be made in this hole-based system. 25 mm lies in diameter steps of 18 and 30mm. Fundamental deviation for 'd' shaft is given by $-16D^{0.44}$. Fundamental deviation of the hole is zero. Tolerance factor $i=0.45\sqrt[3]{D}+0.001D$. IT9=40i & IT8=25i.	(14)	1	3
12. (a)	With neat diagram, explain the working principle of Autocollimator.	(14)	2	2
	(OR)			
(b)	With neat illustrations explain how 'two wire method' is used to measure the outer, inner, and effective diameter of a metric thread.	(14)	2	2
13. (a)	Suggest a suitable interferometer and articulate its working procedure to inspect the flatness of a machined surface. Draw the suitable sketch.	(14)	3	3
	(OR)			
(b)	(i) The role of CMM in industry has become inevitable. Explain this statement with suitable justifications.	(6)	3	3

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	(ii)	Surface flaws of an object is to be inspected. Suggest a suitable non-contact inspection system and explain its procedure with suitable sketches.	**(8)**	**3**	**3**
14. (a)		Suggest a non-contact temperature measuring instrument for remote sensing application. Explain its procedure with neat diagram.	**(14)**	**4**	**3**
		(OR)			
	(b)	Velocity of gases flowing in steel pipes need to be measured. With suitable diagram, explain the working principle of your recommendation. Can your system handle granular pipe materials? Justify it.	**(14)**	**4**	**3**
15. (a)		List the factors governing quality of design and conformances. Describe how these factors are related to Quality of performance.	**(14)**	**5**	**2**
		(OR)			
	(b)	List and discuss the sections of ISO9000 series.	**(14)**	**5**	**2**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	**CO**	**RBT LEVEL**
16.	A manufacturer of consumer goods, became aware through customer feedback that a batch of one of their products contained an unusually high level of defects. The manufacturer wanted to take steps to avoid a repeat of this incident. Since full inspection of every product is found to be expensive, recommend suitable methodology to the manufacturer, so that the risk of future bad batches entering the market will be reduced considerably. Explain your methodology in detail.	**(10)**	**5**	**3**

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