Code: 20ME3602

III B.Tech - II Semester – Regular Examinations – JUNE 2023

METROLOGY AND MEASUREMENTS
(MECHANICAL ENGINEERING)

Duration: 3 hours   Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level   CO – Course Outcome

			BL	CO	Max. Marks
		UNIT-I			
1	a)	List static and dynamic characteristics of an instrument. Which two characteristics are important according to your opinion and why?	L2	CO1	7 M
	b)	Select the measurement scheme for weighing machine system. Draw the block diagram with functional elements in it.	L3	CO1	7 M
		OR			
2	a)	Enumerate the concept of interchangeability and selective assembly. Recommend one suitable example for these and explain them.	L2	CO1	7 M
	b)	Calculate all the relevant dimensions of hole and shaft for a fit $\Phi 35 H_7/f_8$. Dimension 35 mm falls in the step of 30-50 mm. The fundamental deviation for f shaft is $-5.5D^{0.41}$ and $i = 0.45\sqrt[3]{D}+0.001D$ (in microns), IT7=16i and IT8=25i.	L3	CO1	7 M

UNIT-II

3	a)	Discuss the purpose of the profile projector. Draw the neat sketch and explain its working principle.	L3	CO2	7 M
	b)	Build the number of slip gauges for the measurement of the dimension 27.482mm using M87 set. Use two protector slip gauges of 2.0 mm.	L3	CO2	7 M

Set M 87 (special set)

Range (mm)	Steps (mm)	No. of blocks
1.001 – 1.009	0.001	9
1.01 – 1.49	0.01	49
0.5 – 9.5	0.5	19
10 – 90	10	9
1.005	—	1

OR

4	a)	Design the general purpose GO and NO-GO plug gauge for inspecting a hole of $\phi 22 D_8$. Use the following data: Fundamental deviation for hole $D = 16^{0.44}$ and IT8=25i. $i = 0.45 \sqrt[3]{D} + 0.001D$ (in microns).	L3	CO2	7 M
	b)	List types of mechanical comparators. Illustrate any one mechanical comparator and state its advantages and disadvantages.	L3	CO2	7 M

UNIT-III

5	a)	How do you measure the effective diameter of screw thread? Derive an expression for the best wire size to measure effective diameter of a thread.	L3	CO3	7 M

	b)	Draw and explain Parkinson gear tester with a neat sketch. Write two applications of the same.	L3	CO3	7 M
		OR			
6	a)	List out the possible errors that can occur in screw thread. Suggest suitable remedy to eliminate them.	L3	CO3	7 M
	b)	Enumerate the methods of measurement of gear tooth thickness. Which method is better than others and why? Explain the same with a neat sketch.	L3	CO3	7 M

UNIT-IV

7	a)	Describe the working principle of the Talysurf surface roughness tester with a neat diagram.	L2	CO4	7 M
	b)	Calculate CLA and RMS roughness values for the following data: Sampling length: 20 mm, peaks (μm): 40, 42, 40, 41, 42 valleys (μm): 25, 22, 22, 24, 23	L3	CO4	7 M
		OR			
8	a)	List the instruments used for flat surface measurements. Explain the working principle of Auto-collimator with a neat sketch.	L2	CO4	7 M
	b)	Discuss the working of Tomilson surface meter for measurement of Surface Roughness using neat sketch.	L2	CO4	7 M

UNIT-V

9	a)	List instruments used for the measurement of speed and flow. Explain any two in detail with suitable applications.	L2	CO5	7 M
	b)	List various instruments used for the measurement of temperature. Explain the working principle of thermocouple with a neat sketch. State any two alloys used for thermocouples and their temperature ranges.	L3	CO5	7 M

OR

10	a)	Define gauge factor. How strain gauges can be used for the measurement of compressive and tensile stresses in case of cantilever beam with load at one end.	L2	CO5	7 M
	b)	Discuss the working principle of LVDT with a neat sketch and recommend two practical applications.	L3	CO5	7 M