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Course Code

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Fourth Semester B.E. Degree Examinations, September/October 2023

MECHANICAL MEASUREMENTS AND METROLOGY

Duration: 3 hrs

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Missing data, if any, may be suitably assumed

Q. No	Question	Marks	(RBTL:CO: PI)
<u>MODULE – 1</u>			
1. a.	Define Metrology. What are its objectives?	8	(1 :1: 1.6.1)
b.	State the need for inspection, and define the terms Accuracy, Precision and Error with a diagram.	12	(2 :1: 1.6.1)
OR			
2. a.	Describe with a neat sketch the principle of Sine bar and working of an Auto collimator.	10	(2 :1: 1.6.1)
b.	Selection of slip gauges is required to build a height of 48.155 mm and 27.456 mm. give the best combination of gauges using a suitable set.	10	(2 :1: 1.6.1)
<u>MODULE – 2</u>			
3. a.	Describe the following terms 1. Limit 2.fit, 3.tolerance and 4. Allowance with a figure.	8	(2 :2: 1.6.1)
b.	Differentiate Hole basis and Shaft basis systems.	6	(2 :2: 1.6.1)
c.	Briefly explain the Taylor's principle of gauge design	6	(2 :2: 1.6.1)
(OR)			
A clearance fit has to be provided for a shaft and bearing assembly having a diameter of 40 mm. Tolerances on hole and shaft are 0.006 and 0.004 mm, respectively. The tolerances are disposed unilaterally. If an allowance of 0.002 mm is provided, find the limits of size for hole and shaft when (a) hole basis system and (b) shaft basis system are used.			
OR			
4. a.	Define a comparator. Explain the working principle of a sigma comparator.	8	(2 :2: 1.6.1)
b.	What is a LVDT? Explain its working principle. Discuss the characteristic curve of LVDT with a sketch.	6	(2 :2: 1.6.1)
c.	Write a note on Solex comparator	6	(2 :2: 1.6.1)
<u>MODULE – 3</u>			
5. a.	With a neat sketch illustrate the various terminologies associated with screw threads and list some of the applications of it.	10	(2 :3: 1.6.1)
b.	Derive an expression for two wire method to measure effective diameter of a screw thread with necessary sketch's.	10	(2 :3: 1.6.1)

OR

6. a. Briefly explain the following gear tooth thickness measurement techniques **10** (2 :3: 1.6.1)
a. Constant chord method b. Base tangent method
b. Discuss involutes profile and gear roll tester for composite error **10** (2 :3: 1.6.1)

MODULE – 4

7. a. Explain the following with diagrams, **10** (2 :4: 1.6.1)
1. Threshold 2. System Response and Delay 3. Repeatability 4. Range
b. With a block diagram, explain the three stages of a generalized measurement system giving suitable examples. **10** (2 :4: 1.6.1)

OR

8. a. Distinguish between 1. Active and passive transducers, 2. Primary and secondary transducers **6** (2 :4: 1.6.1)
b. Explain the inherent problems associated with mechanical systems. **4** (2 :4: 1.6.1)
c With a neat block diagram, explain the working of a CRO and explain its unique features. **10** (2 :4: 1.6.1)

MODULE – 5

9. a. Briefly discuss about prony brake dynamometer. **6** (2 :5: 1.6.1)
b. With a neat diagram explain the McLeod and Bridgeman gauges **8** (2 :5: 1.6.1)
c Sketch and explain working principle of Proving ring. **6** (2 :5: 1.6.1)

OR

10. a. What is a strain gauge? Explain in detail any one mechanical type of strain gauge **8** (2 :5: 1.6.1)
b. What is a thermo couple? Explain the thermocouple laws. **6** (2 :5: 1.6.1)
c Discuss in detail any one type of optical pyrometer, **6** (2 :5: 1.6.1)