

## Model Question Paper-2 with effect from 2019-20 (CBCS Scheme)

USN

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### Fourth Semester B.E. Degree Examination

### Subject Title MECHANICAL MEASUREMENTS AND METROLOGY

TIME: 03 Hours

Max. Marks: 100

- Note: 01. Answer any FIVE full questions, choosing at least ONE question from each MODULE.  
 02. Assume any missing data suitably  
 03. Draw neat diagram wherever necessary

| Module -1 |   |  | *Bloom's<br>Taxonomy<br>Level | Marks |
|-----------|---|--|-------------------------------|-------|
| Q.01      | a | List the different methods of measurement.   | L1, CO1                       | 5     |
|           | b | Explain the characteristics of line and end standards  | L2, CO1                       | 10    |
|           | c | Three 200 mm gauges to be calibrated are measured on a level comparator by wringing them together and then comparing them with a 600mm gauge. The 600mm gauge has an actual length of 600.0025mm, and the three gauges together have a combined length of 600.0035 mm. When the three gauges are intercompared, it is found that gauge A is longer than gauge B by 0.0020mm but shorter than gauge C by 0.001mm. Determine the length of each gauge. | L3, CO1                       | 5     |
| OR        |   |  |                               |       |
| Q.02      | a | List the different angle measuring instruments used in industry.   | L1, CO1                       | 5     |
|           | b | Explain the Principle of autocollimation and write the application of autocollimator.  | L2, CO1                       | 10    |
|           | c | A selection of slip gauges is required to build a height of 48.865mm. Propose the best combination of gauges using the 103-gauge set.  | L3, CO1                       | 5     |
| Module-2  |   |  |                               |       |
| Q. 03     | a | Give the classification of tolerance   | L1, CO2                       | 5     |
|           | b | Design the general type of GO and NOT GO gauges as per the present British system for a 40mm shaft and hole pair designated as 40 H8/d9, given that (a) $i = 0.453 D^{0.43}$ (b) 40mm lies in the diameter range of 30–50mm (c) IT8 = 25i (d) IT9 = 40i (e) upper deviation of shaft = $-16D^{0.44}$ (f) wear allowance assumed to be 10% of gauge tolerance   | L3, CO2                       | 10    |
|           | c | Sketch and explain the working of Sigma Comparator   | L2, CO2                       | 5     |
| OR        |   |  |                               |       |
| Q.04      | a | What is hole basis system and shaft basis system   | L1, CO2                       | 5     |
|           | b | A clearance fit has to be provided for a shaft and bearing assembly having a diameter of 40mm. Tolerances on hole and shaft are 0.006 and 0.004mm, respectively. The tolerances are disposed unilaterally. If an allowance of 0.002mm is provided, find the limits of size for hole and shaft when (a) hole basis system and (b) shaft basis system are used.  | L3, CO2                       | 10    |
|           | c | With suitable sketch explain the working principle of Linear Variable Differential Transformer   | L2, CO2                       | 5     |
| Module-3  |   |  |                               |       |
| Q. 05     | a | With neat sketch define screw thread terminology   | L1, CO3                       | 5     |
|           | b | A metric screw thread is being inspected using the two-wire method in order to measure its effective diameter and the following data is generated: Pitch = 1.25mm, diameter of the best-size wire = 0.722mm, and distance over the wires = 25.08mm. Determine the effective diameter of the screw thread.  | L3, CO3                       | 10    |
|           | c | Explain the working of Parkinson Gear Tester.  | L2, CO3                       | 5     |
| OR        |   |  |                               |       |
| Q. 06     | a | Explain the 3 wire method of measurement of effective diameter.  | L1, CO3                       | 5     |
|           | b | Sketch and explain the working of Toolmaker's microscope.  | L2, CO3                       | 10    |

|                 |   |   |         |    |
|-----------------|---|---|---------|----|
|                 | c | It is required to measure the effective diameter of a screw using the two-wire method. The distance across 10 threads measured using a scale is 12.5mm. Determine the size of the best wire for metric threads. | L3, CO3 | 5  |
| <b>Module-4</b> |   |   |         |    |
| Q. 07           | a | Explain the two basic methods of measurement  | L1, CO4 | 5  |
|                 | b | With the help of block diagram explain the generalized measuring system.  | L2, CO4 | 10 |
|                 | c | Explain Null and deflection transducers.  | L1, CO4 | 5  |
| OR              |   |   |         |    |
| Q. 08           | a | Identify few terminating devices that are commonly used in an automobile  | L1, CO4 | 5  |
|                 | b | Compare the following:<br>1.Primary and secondary transducers<br>2. Active and passive transducers<br>3. Analog and digital transducers   | L3, CO4 | 10 |
|                 | c | Which type of intermediate modifying devices are preferred and why? Explain.  | L2, CO4 | 5  |
| <b>Module-5</b> |   |   |         |    |
| Q. 09           | a | Write the advantages of RTDs(Resistance Temperature Detector) compared to other types of temperature sensors.   | L2, CO5 | 8  |
|                 | b | With block diagram explain the use of a strain gauge for force determination  | L2, CO5 | 8  |
|                 | c | Explain the working principle of a bimetallic strip with neat sketches.   | L2, CO5 |    |
| OR              |   |   |         |    |
| Q. 10           | a | What is a gauge factor? Explain its importance.   | L1, CO5 | 5  |
|                 | b | With circuit diagram explain the arrangement of a resistance bridge for strain measurement  | L2, CO5 | 10 |
|                 | c | List the different applications of a total radiation pyrometer.   | L1, CO5 | 5  |

\*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.