



# P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Mechanical Engineering

Semester End Examination; May / June - 2018

**Mechanical Measurements and Metrology**

Time: 3 hrs

Max. Marks: 100

**Note:** i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.

ii) Missing data if any suitably assumed.

## UNIT - I

- 1 a. With a block diagram, explain the different elements of Generalized Measurement System. 10
- b. Discuss any five different performance characteristics of a Measurement System. 10
- 2 a. List the disadvantages of Material Standards. 5
- b. Enumerate the characteristics of End Standards. 5
- c. Three 200 mm gauges to be calibrated are measured on a level comparator by wringing them together and then comparing with 600 mm gauge. The 600 mm gauge has an actual length of 600.0025 mm and the three gauges together have a combined length of 600.0035 mm. When the three gauges are inter compared it is found that gauge A is 0.0020 mm longer than gauge B, but shorter than gauge C by 0.001 mm. Determine the length of each gauge. Sketch the arrangement. 10

## UNIT - II

- 3 a. With an example, explain why progressive dimensioning from a common reference line or base line dimensioning is adopted while specifying tolerances. 8
- b. The limits of the hole and shaft are;
- $$\text{Hole} = 20 \begin{matrix} +0.05 \\ +0 \end{matrix} \text{ mm} \text{ and shaft} = 20 \begin{matrix} +0.08 \\ +0.06 \end{matrix} \text{ mm} .$$
- Determine minimum clearance and maximum clearance type of fit. Also represent the above arrangement with the help of a neat sketch. 6
- c. Explain different types of geometric tolerance. 6
- 4 a. Sketch and explain hole basis and shaft basis system. Explain why hole basis system is preferred over shaft basis system? 8
- b. Design Go and NoGo plug and snap gauges for a hole and a shaft having 20H7g6 fit. The hole and the shaft tolerance are respectively
- $$\text{Hole} = 20 \begin{matrix} +0.021 \\ +0 \end{matrix} \text{ mm} \text{ and shaft} = 20 \begin{matrix} -0.007 \\ -0.020 \end{matrix} \text{ mm}$$
- Show the disposition of tolerances. 12

## UNIT - III

- 5 a. Explain the following : 14
- i) Sigma mechanical comparators                      ii) Zeiss ultra optimeter

- b. What are angle gauges? Using the set of 16 angle gauges set an angle of  $20^{\circ}40'10''$  also sketch the arrangement. 6
- 6 a. Explain the three different methods of quantifying surface roughness with neat sketches. 9
- b. With a neat sketch, explain the principle and working of an auto collimator. 7
- c. Derive an expression for the best size wire. 4

**UNIT - IV**

- 7 a. Distinguish between active and passive transducers and direct and indirect transducers. 8
- b. Derive an expression for determining the sensitivity of a ballast circuit. 6
- c. With a block diagram, explain the working of a Telemetering system. 6
- 8 a. With a neat sketch, describe a single stage electronic amplifier. 6
- b. Discuss the following inherent problems associated with mechanical systems : 6
- i) Reflected frictional amplification
- ii) Reflected inertial amplification
- c. With a neat diagram, describe the working of CRO. 8

**UNIT - V**

- 9 a. Enumerate the different steps to be followed while bonding the gauge to the specimen. 6
- b. Define gauge factor. Derive an expression for the gauge factor and explain its importance. 8
- c. Explain the working of a proving ring with a neat sketch. 6
- 10 a. With a neat diagram, describe the working of a gauge used for vacuum measurements. 8
- b. With a neat sketch, discuss the working of an optical pyrometer. 8
- c. Write a note on thermocouple materials. 4

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