

USN

--	--	--	--	--	--	--	--	--	--

10MEB402/10AUB402

**Fourth Semester B.E. Degree Examination, June/July 2018**  
**Mechanical Measurements and Metrology**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting  
at least TWO questions from each part.**

**PART – A**

- 1 a. Define metrology. State the objectives of metrology. (05 Marks)
- b. Using NPL method, derive equation for calibrating End standard from line standard. (08 Marks)
- c. Four end bars A, B, C and D are to be calibrated using a calibrated length bar of 400 mm whose actual length is 399.9998 mm. The bar B is longer than bar A by 0.0004 mm, bar C is longer than bar A by 0.0003 mm, while bar D is shorter than bar A by 0.0001 mm. The four gauges together have a combination length of 400.0002 mm. Determine the actual length of each end bar. (07 Marks)
- 2 a. What is tolerance? Why it is necessary to give tolerance? (04 Marks)
- b. Differentiate between the following:
  - (i) Unilateral tolerance and bilateral tolerance. (04 Marks)
  - (ii) Hole basis system and shaft basis system. (04 Marks)
- c. Design the general type 'GO' and 'NOGO' gauges for a component having  $25H_7/f_8$  fit following details may be used:
  - (i)  $i = 0.45\sqrt[3]{D} + 0.001D$  microns
  - (ii) Upper deviation for 'f' shaft is  $= -5.5D^{0.41}$
  - (iii)  $IT_7 = 16i$  and  $IT_8 = 25i$
  - (iv) 25 mm falls in diameter step of 18-30 mm
  - (v) Wear allowance on gauge = 10% of gauge tolerance.
 Also determine (i) Type of fit (ii) Allowance for the above fit. (12 Marks)
- 3 a. What is a comparator? How does it differ from a measuring device? (04 Marks)
- b. Describe with a neat sketch construction and working of LVDT. (08 Marks)
- c. Explain the use of sine bar for measuring a known and unknown angles of small component. (08 Marks)
- 4 a. With a neat sketch, explain the working principle of autocollimator. (06 Marks)
- b. What is the best size wire? Derive an expression for the best size wire in terms of the pitch and angle of the thread. (08 Marks)
- c. How do you measure the chord thickness of spur gear tooth using gear tooth vernier. Explain with a neat sketch. (06 Marks)

**PART – B**

- 5 a. Explain the concept of "Generalized measurement system" with a block diagram taking the working of bourdon pressure gauge as an example. (08 Marks)
- b. Distinguish between systematic errors and random errors. (06 Marks)
- c. What is a transducer? What are the advantages of electrical transducers? (06 Marks)

- 6 a. Explain the inherent problems present in mechanical modifying system. (06 Marks)  
b. With a block diagram, explain the general telemetering system. (06 Marks)  
c. With a neat sketch, explain the working principle of CRO. (08 Marks)
- 7 a. Sketch and explain the Platform balance method of measuring force. (06 Marks)  
b. Sketch and explain the working of Prony brake dynamometer. (04 Marks)  
c. Define the following:  
(i) Absolute pressure (ii) Gauge pressure (04 Marks)  
(iii) Vacuum pressure (iv) Atmospheric pressure (06 Marks)  
d. With a neat sketch, explain the working of Mcleod gauge.
- 8 a. State the laws of thermocouple. (04 Marks)  
b. Explain the construction and working of optical pyrometer. (08 Marks)  
c. Write a note on strain gauge backing materials and bonding material. (04 Marks)  
d. Write a note on calibration of strain gauge. (04 Marks)

\* \* \* \* \*