

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.
 (ii) Hole basis system and shaft basis system. (04 Marks)
 c. Design the general type 'GO' and 'NOGO' gauges for a component having 25H₇/f₈ fit following details may be used:
 (i) $i = 0.45\sqrt{D} + 0.001D$ 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)

* * * * *