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10ME/AU42B

# Fourth Semester B.E. Degree Examination, June/July 2017
## 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. **(06 Marks)**

b. With the help of a neat sketch, explain "international prototype meter". **(06 Marks)**

c. Distinguish between line standard and end standard. **(04 Marks)**

d. Write a note on slip gauges and explain wringing phenomenon. **(04 Marks)**

2 a. Define the following geometrical tolerances:
i) Straightness ii) Circularity iii) Cilyndricity **(06 Marks)**

b. In brief, explain the concept of "Universal Interchangeability" and "selective assembly". **(06 Marks)**

c. Determine the dimensions to be provided for a shaft and hole of 90 mm size H8/e9 type fit. Size 90 mm falls in diameter step of 80 – 100 value of tolerance for IT8 and IT9 grades are 25i and 40i respectively. Value of fundamental deviation for 'e' type shaft is $-11\ D^{0.41}$. State the type of fit. **(08 Marks)**

3 a. Define a comparator and state the uses of comparator. **(04 Marks)**

b. With a neat sketch, explain the principle of sigma comparator. **(08 Marks)**

c. With the help of a neat sketch, explain the working principle of "zeiss ultra optimeter". **(08 Marks)**

4 a. With a neat sketch, explain the working principle of an 'autocollimator'. **(08 Marks)**

b. With the help of a sketch, define the following:
i) Major diameter ii) Minor diameter
iii) Effective or pitch diameter iv) Depth of thread **(06 Marks)**

c. Sketch and explain gear tooth verneir. **(06 Marks)**

### PART – B

5 a. With the help of a block diagram, explain the "generalized measurement system". **(08 Marks)**

b. Define the following (with sketches wherever necessary):
i) Accuracy ii) Precision iii) Sensitivity iv) Repeatability **(08 Marks)**

c. What are the sources of errors in measurement? **(04 Marks)**

6 a. Explain the inherent problems present in the mechanical intermediate modifying devices. **(06 Marks)**

b. Explain the working principle of a 'cathode ray oscilloscope' (with sketch). **(08 Marks)**

c. What is a Ballast circuit? Explain with a neat sketch. **(06 Marks)**

7 a. With the help of a neat sketch, explain the working of a hydraulic dynamometer. **(08 Marks)**

b. Explain with a neat sketch the McLeod gauge used for pressure measurement. **(08 Marks)**

c. Sketch and explain the measurement of force using proving ring. **(04 Marks)**

8 a. Explain: i) Cross sensitivity and (ii) Temperature compensation. **(06 Marks)**

b. State the laws of thermocouple. **(04 Marks)**

c. Explain, how a strain gauge is calibrated. **(04 Marks)**

d. Explain the working of a resistance thermometer. **(06 Marks)**

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