

**DIPLOMA IN MECHANICAL ENGINEERING
(DME)**

Term-End Examination

00382

December, 2017

BME-062 : METROLOGY AND INSTRUMENTATION

Time : 2 hours

Maximum Marks : 70

Note : Question no. 1 is compulsory. Attempt any four questions from questions no. 2 to 6. All questions carry equal marks. Use of scientific calculator is permitted.

1. Choose the correct answer from the given four alternatives : $14 \times 1 = 14$

(a) The ease with which observations can be made accurately is referred to as

- (i) Readability
- (ii) Sensitivity
- (iii) Accuracy
- (iv) Precision

- (b) Tolerances are specified
 - (i) to obtain desired fits
 - (ii) because it is not possible to manufacture a size exactly
 - (iii) to obtain high accuracy
 - (iv) to have proper allowance

- (c) Surface plate is usually made of grey cast-iron because it provides
 - (i) non-wearing plate
 - (ii) very hard plate
 - (iii) easy to cast plate
 - (iv) lubrication due to graphite flakes

- (d) Constant measuring pressure in micrometer screw gauges is ensured by
 - (i) Locknut
 - (ii) Barrel and thimble
 - (iii) Spindle
 - (iv) Ratchet

- (e) Optical gauge works on the principle of
 - (i) Refraction
 - (ii) Reflection
 - (iii) Dispersion
 - (iv) Polarisation

- (f) Millimeter scale in a micrometer is marked on
- (i) Barrel
 - (ii) Thimble
 - (iii) Spindle
 - (iv) Anvil
- (g) Profile of a gear tooth can be checked by
- (i) Sine bar
 - (ii) Bench micrometer
 - (iii) Optical pyrometer
 - (iv) Optical projector
- (h) The accuracy of a 0 – 10 mV meter is ± 10 percent. A full scale reading of 10 mV may be due to a voltage of
- (i) 9 mV
 - (ii) 11 mV
 - (iii) either 9 mV or 10 mV
 - (iv) either 9 mV or 11 mV
- (i) Which one of the following is the least accurate measuring device ?
- (i) Air gauge
 - (ii) Micrometer screw gauge
 - (iii) Optical projector
 - (iv) Steel scale

- (j) **The reliability of an instrument means**
 - (i) **The maximum useful life of an instrument**
 - (ii) **The service of an instrument between two repairs**
 - (iii) **The range in which the characteristics of an instrument remain linear**
 - (iv) **The degree to which repeatability continues to remain within specified limits**

- (k) **An optical gauge works on the principle of**
 - (i) **Reflection of light rays**
 - (ii) **Polarisation of light rays**
 - (iii) **Interference of light rays**
 - (iv) **Refraction of light rays**

- (l) **A plug gauge is used for measuring**
 - (i) **Cylinders**
 - (ii) **Cylindrical bores**
 - (iii) **Spherical holes**
 - (iv) **Screw threads**

- (m) The term 'Allowance' in limits and fits is usually referred to
- (i) minimum clearance between the shaft and the hole
 - (ii) maximum clearance between the shaft and the hole
 - (iii) difference of tolerances of the hole and the shaft
 - (iv) difference between maximum size and minimum size of the hole
- (n) Auto-collimator is used for the measurement of
- (i) Small angular differences
 - (ii) Flatness
 - (iii) Linear surfaces
 - (iv) Concavity

2. A hole is dimensioned as $25^{+0.033}_{+0.0}$ mm and the shaft is dimensioned as $25^{-0.040}_{-0.061}$ mm. Determine the hole tolerance, the shaft tolerance and the allowance of fit. What type of fit shall be established ?

14

3. Explain the difference between allowance and tolerance. Also explain unilateral and bilateral tolerances. State their advantages and disadvantages.

14

4. (a) The diameter of a steel ball is measured five times with a micrometer, giving the following results :

8.011 mm, 8.005 mm, 8.009 mm,
8.014 mm and 8.011 mm

Calculate the mean diameter.

- (b) Describe the relative advantages of Micrometers and Vernier Calipers. 7+7
5. (a) What is a Comparator ? Compare mechanical comparator with electrical comparator.
- (b) What is a Protractor ? Sketch a universal protractor and describe its functioning. 7+7
6. (a) Sketch a vernier caliper and show how it measures the diameter of a wire. Compare it with a micrometer.
- (b) Name the various types of fits used for the purpose of assembly of machine parts. Describe any one of them in detail. 7+7
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