Prod/M&I/V/CBGS/03-12-2016
Metrology & Instrumentation

Q. P. Code : 608300

Hours: 03 **Marks: 80**

Note : 1. Question number 1 is **compulsory**
2. Solve any **Three** questions from remaining **Five** questions
3. **Assume** suitable data if required.
4. Draw neat sketches wherever necessary.

Q.1. (a) Answer **any Seven** of the following in 2-3 lines each. Draw figure wherever required. **14**

i) Give examples for following methods of measurement.
i) Direct measurement ii) Indirect measurement iii)Fundamental measurement

ii) Differentiate between Accuracy and Precision.

iii) State the causes of following pitch error in screw thread.
i) Progressive error ii) Drunken error

iv) Explain why white light cannot be used in interferometry.

v) Pick holes from following list and arrange then in decreasing order of tolerance. Indicate the holes with negative fundamental deviation:
E7, M6, d8, D20, f12, g9, N16.

vi) How chordal gear tooth thickness measurement method is superior to pitch line method of measurement.

vii) Sigma comparator is less accurate than optical comparator, Yes or NO? Why?

viii) Mention a few important precautions for use of instruments so as to avoid inaccuracies in measurements

(b) Name the transducer used for measurement of linear displacement. Explain any one of them with its advantage and limitations. **06**

Q.2. (a) State the methods which used for measuring effective diameter. Explain any one of them. What is 'Best size' wire? Derive an expression for the same in terms of the pitch and angle of the thread. **10**

(b) What is the role of Mater gear in Parkinson gear tester? Why it is called Mater gear? Comment with sketches briefly in: **10**

i)Tooth to tooth composite error

ii)Backlash testing and its measurement in a meshing gear pair.

Q.3. (a) Draw a neat labelled diagram of Taylor Hobson Talysurf and briefly explain its working principle. **10**

(b) What is Comparator? Describe in brief the construction and working of a ***Pneumatic comparator*** with the help of a neat sketch. List its advantages and disadvantages. **10**

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Q.4. **(a)** State Taylor's principle for gauging finished work pieces? **14**

Design and sketch plug and ring 'GO' and 'NO GO' gauges for designation H7d8 as per IS specification. The following assumption may be made:

Shaft and hole pair = 50 mm diameter.

Upper deviation of shaft 'd' = $- 16 D^{0.44}$

Tolerance unit i(in microns) = $0.45 D^{1/3} + 0.001 D$

IT 6 = 10 i

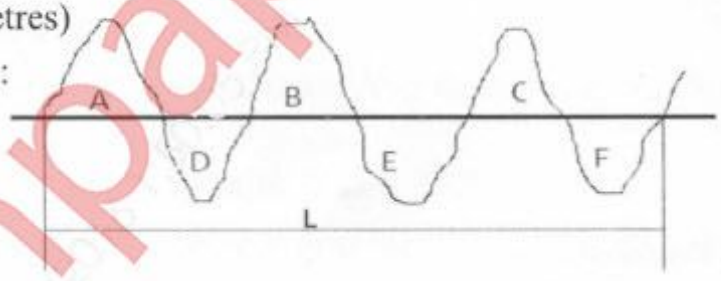
Above IT 6 grade, the tolerance magnitude is multiplied by 10 at each fifth step.

(b) Describe in detail the types of screw threads available with ISO system, and explain the principle underlying the designation of these screw threads. **06**

Q.5. **(a)** Briefly explain the significance of surface finish evaluation. A rectilinear pen recording of a diamond turned surface is shown in figure. The sampling length (L) used was 0.8 mm and V/H magnification ratio was 5000/100. **10**

Calculate the R_a if the areas (in square millimetres) above and below the mean line are as follows :

A	B	C	D	E	F
60	115	96	92	109	70



(b) What is meant by the term "Flatness" as applied to metrology? State the characteristic of the surface that is responsible for its interferometric measurement. What are the advantages of laser as a light source in interferomatric measurement? **10**

Q.6. **(a)** Explain constant chord. The use of tangent comparator has increased in relation to gear tooth caliper, state technical reasons for the same. **05**

(b) Explain the method of employing sine bar for angle measurement. **05**

(c) Write the short notes on :(ANY TWO) **10**

i) Tool maker's microscope.

ii) ***Interchangeability*** and its importance.

iii) Torque Sensors
