§ TE-II) Mechology & Instrumentation

28-11-2014

PROD

QP Code : 14895

(3 Hours) **[Total 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 Six** of the following in 2-3 lines each. Draw figure wherever required. **12**

i) What do you understand by "Reading value" of an instrument? What does it signify?

ii) Discuss effect of temperature on application of limits?

iii) State one advantage & one disadvantage of an adjustable gap gauge when compared with a fixed jaw gap gauge.

iv) What is the usual range of a magnification of mechanical comparator? What is the magnification obtained in bench micrometer?

v) Explain Abbe's alignment principle. Define cosine error

vi) Describe the effect if parallax error, poor contact, temperature on precision measurement

vii) The assembly 50H8n7 represents a clearance fit. State True or False and justify.

viii) Why the monochromatic light is used for interferometry work and not the white light?

(b) Define the term constant chord. Calculate the chord length and its distance below the tooth tip for a gear of module 3 and 20° pressure angle .Explain various methods for checking gear tooth thickness **08**

Q.2. **(a)** Define the tooth thickness in case of a simple spur gear. Mention some special features of a gear tooth vernier caliper. What is expected accuracy of such vernier. Does a gear tooth vernier actually measure the defined tooth thickness? If not, state the mathematical relations which you will apply to find the correct thickness. **10**

(b) A hole is 30±0.025 mm in diameter & a shaft which fits it is 29.1-0.025 mm in diameter. Answer the following question **05**

i) It this transition fit? ii) Are the limits unilateral?

iii) What is the total tolerance on the shaft, iv) What is nominal size?

Give brief explanations whenever are necessary.

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(c) A pneumatic comparator has a linear characteristic given $\frac{\rho}{P} = -0.5\frac{M}{C} + 1.1$ over the range $\frac{\rho}{P}$ from 0.55 to 0.86 and is supplied with air at 2.5 bar. The control jet is 0.6 mm dia and magnification factor of the meter used is 2000. What diameter measuring jet should be fitted so that a range of 0.03 mm is just within the linear range stated? **05**

Q.3. (a) Explain what do you understand by i) an end standard ii) a line standard iii) wavelength standard. Sketch & describe the imperial standard YARD & state under which of the above categories this falls. What are the purpose of (a) Parliamentary copies of standard yard (b) Secondary & working standards? What are the advantages of wavelength standards over end standards? **10**

(b) Describe the construction & working of a commercial tool maker's microscope. How it can be used to measure screw thread? Compare this with a mechanical measuring machine/instrument in measuring efficiency. **10**

Q.4. (a) Discuss the difference allowances that must be taken into account in the manufacture of a gauge. Determine the actual dimensions to be provided for a shaft & hole of 90mm size for H8e9 type clearance fit. Size 90mm falls in diameter steps of 80-100. **12**

Value tolerance unit i= $0.45\sqrt[3]{D}+0.001D$.

Value of tolerances for IT8 & IT9 grades are 25i and 40i.

Value of fundamental deviation for 'e' type shaft is $-11D^{0.41}$.

Also design the 'GO' & 'NOGO' gauges as per present British system in which same workshop & inspection gauges are used.

(b) W hat is meant by term "flatness" as applied to metrology? State characteristics of surface that is responsible for its interometric measurement. Explain laser interferomatry. What are the advantages of laser as a light source in interferometric measurements? **08**

Q.5. (a) a) Write short note on : (Any Two) **10**

i) Pneumatic comparator.

ii) Taylor Hobson Talysurf.

iii) Best size wire

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(b) Describe with neat sketch the construction & working of a "Strain gauge" torque meter. Also explain strain gauge load cells method used for free measurements. **10**

Q.6. (a) State briefly why comparators are used in engineering practice. A "GAP" gauge has between designed for checking the diameter of a typical shaft. Can this gauge be known as a comparator? Why or Why not? **03**

(b) Describe the terms "Primary texture" & "Secondary texture". Describe, in detail, one type of instrument used for obtaining a graphical record of the primary texture. **06**

(c) Describe in some detail the type of screw thread available with ISO system, and explain the principle underlying the designation of these screw threads. **06**
