



May - June - 2011

[3963] – 217

T.E. (Mechanical) (Semester – II) Examination, 2011
METROLOGY AND QUALITY CONTROL
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

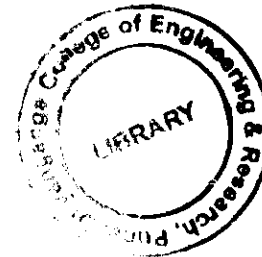
- Instructions :** 1) Answer 3 questions from Section I and 3 questions from Section II.
 2) Black figures to the **right** indicate **full** marks.
 3) Use of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.
 4) Attempt **any one** question in **each** Unit.
 5) Assume **suitable** data.
 6) Answer to the Sections I and II should be written **separately**.
 7) Answer 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10, 11 or 12.

SECTION – I

Unit – 1

1. a) Differentiate between :

- i) Systematic errors and Random error,
- ii) Accuracy and Precision.



3

3

b) What is the difference between Alignment Test and Performance Test ? Explain with neat sketches any four such tests on a Lathe machine.

10

OR

2. a) Enumerate types of errors and sources of errors in dimension measurements and discuss Cosine and Parallax error with suitable example.
- b) Differentiate between Mechanical and Pneumatic comparator. Explain with sketch the principle and working of Sigma Comparator.

6

10

Unit – 2

3. a) A shaft of 35 ± 0.004 mm is to be checked by means of GO – NO GO gauge. Design the required dimensions for gauge. Draw the diagrammatic representation.
- b) Describe with neat sketch the optical arrangement of NPL Gauge Length Interferometer and explain how it is used to compute the thickness of slip gauge.

10

8

OR

P.T.O.



4. a) Design and make drawing of general purpose Go – NO GO Ring Gauge for inspection of a shaft of $\phi 30$ f8. Given data with usual notations : 10
 Tolerance unit = $i = 0.45 \sqrt[3]{D} + 0.001 D$,
 Fundamental deviation for shaft 'f' = $-5.5D^{0.41}$,
 The value of tolerance for IT8 = $25i$, IT9 = $40i$, Dia. Step = 18 – 30.
- b) Define terms : Primary and Secondary Textures and describe with neat sketch Taylor Hobson Surface Meter. 8

Unit – 3

5. a) Show that the best wire size for measuring effective diameter of thread is given by $d = (p/2) \sec(\theta/2)$. (where, p = pitch of the thread). 6
- b) Sketch and describe a Gear Tooth Vernier Caliper. 4
- c) Write a short note on : Computer controlled Co-ordinate Measuring Machine. 6

OR

6. a) Describe use of Devid Brown Tangent Comparator instrument for gear measurement. Calculate the dimension of the Base Tangent Length over 5 teeth, when gear under inspection has following specifications : No. of teeth = 30, Module = 4, Pressure angle = 20° , The shift of the tool in the gear to provide backlash = 0.03 mm. 8
- b) Discuss various types of pitch errors in screw threads. 4
- c) Explain use of Lasers in Metrology. 4

SECTION – II

Unit – 4

7. a) Explain following Tools and techniques used for problem solving in quality circles. 12
 1) Brain storming
 2) Cause and effect diagram
 3) Pareto analysis.
- b) Draw a neat sketch of House of quality and show various steps in QFD process. 4

OR

8. a) Explain to make up the award criteria for Malcolm Balbrige national quality award. 5
- b) Explain basic elements of just in time. 6
- c) Explain Juran trilogy diagram. 5



Unit – 5

9. a) Explain POKA-YOKE method developed by Shiego Shingo. 5
 b) Explain purpose of Quality Audit. 5
 c) What are the implementation methodologies and limitations/difficulties in achieving ISO registration ? 6

OR

10. a) Explain contribution of Demings fourteen point towards quality improvement. 6
 b) Explain : 10
 i) FMECA ii) FTA

Unit – 6

11. a) Differentiate between single sampling, double sampling and sequential sampling plan. 9
 b) Define following elements and show quality region on OC curve : 5
 1) α – Risk 2) β Risk 3) AOQ
 c) Draw characteristics of OC curve. 4

OR

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12. a) Calculate process capability and show the six-sigma and specified tolerance on normal distribution curve and comment specification of item 500 ± 5 , $n = 5$, $N = 20$, $A_2 = 0.58$, $D_3 = 0$, $D_4 = 2.11$, (Use Table No. 1) Plot the chart and comment. 10

Table No. 1

Batch	1	2	3	4	5	6	7	8	9	10
\bar{X}	501	498	500	503	501	500	497	502	503	496
R	3	4	2	4	3	5	4	2	6	4

- b) Draw the flow chart for double sampling plan when $N = 1500$ 4
 $n_1 = 100$ $c_1 = 2$
 $n_2 = 50$ $c_2 = 4$
 c) Calculate AOQ for single sampling plan $N = 10,000$, $C = 1$, $P = 0.004$, $P_a = 0.558$. 4