Seat No.

T.E. (Mechanical and Automobile) (Semester – II) Examination, 2014
METROLOGY AND QUALITY CONTROL
(2008 Course)

Time : 3 Hours

Max. Marks : 100

Instructions : 1) Answers to the **two** Sections should be written in **separate** answer books.
      2) Answer **any three** questions from **each** Section.
      3) **Neat** diagrams must be drawn **wherever** necessary.
      4) Figures to the **right** side indicate **full** marks.
      5) **Use** of calculator is **allowed**.
      6) Assume suitable data if **necessary**.

SECTION – I

1. a) Explain principle's of engineering metrology along with types of standards.   8

  b) Explain construction and working of solex pneumatic comparator.   8

       OR

2. a) Define straightness, flatness, circularity, concentricity. Also explain roundness measurement method.   8

  b) State different angle measuring instruments, explain autocollimator in details.   8

3. a) Explain with neat sketch principle and working of NPL flatness interferometer.   8

  b) What are surface texture and its types ? Explain methods for analysis of surface traces.   8

       OR

4. a) State Taylor's principle of gauge design. Shafts of 75 ± 0.02 mm diameter are to be checked by the help of 'GO', 'NOT GO' snap gauge. Design the gauge, sketch it and show its GO size and NOT GO size dimensions. Assume normal wear allowance and gauge maker's tolerance.   8

  b) Explain laser interferometer and Tomlinson surface tester.   8

5. a) Explain construction, working of co ordinate measuring machine.   6

  b) Derive how to select best wire size for effective diameter measurement. Calculate best wire size for inspecting thread plug gauge of M27×3 mm size.   6

  c) State and explain different methods of gear measurement.   6

       OR

6. a) Derive how to set 'h' distance in the vertical arm of gear tooth Vernier caliper and calculate the settings of gear tooth Vernier to inspect a gear having 34 teeth and with module 5.   6

b) State different types of errors in thread measurement, explain how to measure pith error in details.   6

c) Explain UMM and machine vision.   6

SECTION – II

7. a) Explain Juran's trilogy approach.   5

   b) Explain Deming's PDCA and PDSA cycle.   5

   c) What are different quality costs ? Explain cost of quality and value of quality.   6

                                    OR

8. a) State seven quality control tools and explain any two.   6

   b) Write a note on concurrent engineering.   5

   c) Write a note on quality circle.   5

9. a) What is JIT ? Explain in details its applications.   5

   b) Explain eight pillars of TPM.   6

   c) Explain Poka Yoke with example.   5

                                    OR

10. a) Write a note on ISO: TS 16949.   6

    b) What do you mean by FMECA ? Explain in detail.   5

    c) Explain Kanban in details   5

11. a) The following readings were taken for a control chart (Shown in Table).   8

    a) Calculate $\bar{\bar{x}}$ & $\bar{R}$

    b) Calculate control limits

    c) Draw $\bar{x}$ & R Chart and comment whether the process is in control or not ?

       Take A2 = 0.577, d2 = 2.326, D3 = 0, D4 = 2.115

Sample No.	X1	X2	X3	X4
1	80.74	80.76	80.77	80.73
2	80.73	80.76	80.72	80.75
3	80.82	80.75	80.77	80.81
4	80.74	80.73	80.71	80.77
5	80.74	80.75	80.73	80.74
6	80.76	80.75	80.74	80.74
7	80.78	80.77	80.76	80.80
8	80.78	80.77	80.80	80.81

b) Explain operating characteristics curve with LTPD, AQL, Producer's risk (α) Consumer's risk (β). 6

c) Explain concept of six sigma. 4

OR

12. a) Following is the record for successive lots of a part being produced by a plastic molding press. As each lot is come off the line a random sample of 150 pieces were inspected (results are expressed to the nearest 0.1%) calculate $\overline{P}$, control limits and plot control chart and comment. 8

Lot No.	Sample size	No. of defective
1	150	4
2	150	8
3	150	2
4	150	4
5	150	4
6	150	6
7	150	10
8	150	4
9	150	6
10	150	8

b) State the difference between single, double and multiple sampling plan. 6

c) Explain control chart pattern and the reasons for such pattern. 4

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