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Roll No.:.....

NATIONAL INSTITUTE OF TECHNOLOGY CALICUT
Department of Mechanical Engineering
End Sem Examination, April 2014
VI Semester B.Tech. – Mechanical Engineering

ME3112 METROLOGY AND INSTRUMENTATION Part B

Time: Three hours

Maximum Marks: 25

Answer Part A and Part B in separate answer books.
All questions carry 2 marks each, unless mentioned otherwise.

Approved tables are permitted

1. Differentiate between independent variables and noise variables with examples of each.
2. Explain how lack of randomization can cause bias in improperly planned experiments.
3. What are the benefits of replication?
4. A thermocouple is dipped into boiling water from an initial temperature of 30 °C. If the time constant is 2 s, after what time will the reading correspond to 95 °C?
5. A seismic instrument with a mass of 25 kg and damping ratio of 0.72 uses a spring of stiffness 2500 N/m. Determine the dynamic error percentage if a signal of 0.79 Hz is applied to the instrument.
6. Design a ring gauge (sketch and dimension) to inspect a shaft of diameter $30_{-0.140}^{-0.080}$ mm. Use unilateral tolerances with wear allowances.
7. Discuss the common materials used for making gauge blocks.
8. Determine the true size of a gauge block of nominal size 6.3 mm, which gave the following results during calibration with an NPL type Gauge Interferometer:

Colour	Radiation wavelength (μm)	Observed fraction
Red	0.6438	0.07
Green	0.5086	0.87
Blue	0.48	0.04
Violet	0.4678	0.66

(4 marks)

9. Sketch the various parts of the probing system of a CMM.
10. Explain the purpose of stylus qualification in a CMM.
11. Distinguish between roughness, waviness and form error.

(3 marks)

12. a) Give one good point about this course b) Give one suggestion which you think will best improve this course.