Reg. No.										

Manipal Institute of Technology, Manipal

Constituent Institute of Manipal University

V SEMESTER B.TECH (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: METROLOGY [AAE 359]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.

1A. Define the following: **(03)**

I. Range of measurement
II. Sensitivity
III. Repeatability

1B. Describe international prototype of meter with a neat sketch. **(04)**

1C. It is required to calibrate four length bars A, B, C and D, each having a basic length of 150mm. A calibrated length bar of 600 mm is used for this purpose. The 600 mm bar has an actual length of 599.9991 mm. It is observed that **(03)**

$L_B = L_A + 0.0001$ mm

$L_C = L_A + 0.0005$ mm

$L_D = L_A + 0.0001$ mm

$L_A + L_B + L_C + L_D = L + 0.0003$ mm

Determine L_A, L_B, L_C and L_D.

2A. Define unilateral and bilateral tolerances. Give examples for each. **(02)**

2B. What is meant by tolerance accumulation? Explain how it can be resolved. **(03)**

2C. Design a general type of GO and NO GO gauge for components having 30 H7/f8 fit. Given that **(05)**

I. Upper deviation of 'f' shaft = $-5.5\ D^{0.41}$
II. Diameter step : 18-30 mm
III. IT7 = 16i

IV. IT8 = 25i

V. Wear allowance = 10% of gauge tolerance

3A. What is the main purpose of V-block? What is the basis for their classification? **(02)**

3B. Why are slip gauges called Johansson gauges? Explain the phenomenon involved in wringing of slip gauges. **(03)**

3C. Sketch and explain the working principle of sigma mechanical comparator. **(05)**

4A. Sketch and explain optical system used in an NPL flatness interferometer. Discuss the procedure of measuring error in parallelism using the same. **(04)**

4B. Discuss the functional and metrological features of pneumatic comparators. **(03)**

4C. In the measurement of surface roughness, heights of 20 successive peaks and valleys were measured from a datum and were: 35, 25, 40, 22, 35, 18, 42, 25, 35, 22, 36, 18, 42, 22, 32, 21, 37, 18, 35, 20 microns. If these measurements were obtained over a length of 25 mm, determine the C.L.A and R.M.S values of the rough surface. Determine the grade of roughness in case of R_a value. **(03)**

5A. Sketch and explain the working principle of Tomlinson surface meter. **(04)**

5B. Derive the expression for finding effective diameter of wire by two-wire approach. **(03)**

5C. How Taylor's principle is applicable to thread gauging? Explain. **(03)**

6A. Calculate a) Pin diameter, b) Distance over pins spaced 13 teeth apart, for a gear of pressure angle 18^0, having 45 teeth and module of 4. **(03)**

6B. Derive the expression for gear tooth measurement by base tangent method. **(04)**

6C. Calculate the base tangent for a 15^0 pressure angle gear, having 35 teeth and module of 3. **(03)**