Reg. No.										

Manipal Institute of Technology, Manipal

Constituent Institute of Manipal University

V SEMESTER B.TECH (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, DEC 2015/JAN 2016

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. Differentiate between accuracy and precision. **(03)**

1B. Differentiate between line standard and End standard. **(03)**

1C. Three 200mm end bars (P, Q and R) are measured by first wringing them together and comparing with a 600 mm bar. They are then inter compared. The 600 mm bar has a known error of 40µm and the combined length of three end bars is found to be 64µm less than the 600 mm bar. It is observed that bar P is 18µm longer than bar Q and 23µm longer than bar S. Determine the lengths of three end bars. **(04)**

2A. Explain the terms interchangeable manufacture and interchangeable assembly. **(02)**

2B. Explain why special attention should be given to GO gauges compared to NO GO gauges during the gauge design. **(03)**

2C. Design a general type of GO and NO GO gauge for components having 50 H7/d9 fit. Given that **(05)**

I. Upper deviation of shaft = $-16\ D^{0.44}$

II. Diameter step : 30-50 mm

III. IT7 = 16i

IV. IT9 = 40i

V. Wear allowance = 10% of gauge tolerance

3A. Explain the working mechanism of a dial indicator. **(02)**

3B. Sketch and explain the essential features of Vernier caliper. **(03)**

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

4A. Write a note on pitter- NPL gauge interferometer. **(03)**

4B. Explain the measurement methodology involved in the use of optical flats. **(03)**

4C. Calculate the range of linear measurement, measuring head sensitivity, pneumatic sensitivity and overall magnification for the pneumatic comparator for functional pressure range of $0.5 < \frac{p}{P} < 0.8$. where **(04)**

a) b= 0.75 for an operating pressure of 3 bar; A= 1.10
b) Measuring orifice diameter = 1 mm
c) Control orifice diameter = 0.5 mm
d) Deflection observed for the back pressure gauge is found to be 15 mm for pressure change of 0.02 bar

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

5B. Derive the expression for best size wire in a two-wire method. **(03)**

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

6A. Derive the expression for gear tooth measurement by constant chord method. **(04)**

6B. A metric screw thread is being inspected using the two wire method in order to measure its effective diameter and the following data is generated: Pitch=1.15 mm, diameter of the best size wire= 0.722mm, and the distance over the wires = 25.08 mm. Determine the effective diameter of screw thread. **(03)**

6C. The following data is available for measurement of chordal thickness of a gear having a involute profile: No of teeth = 32, Addendum circle diameter= 140 mm, Pressure angle = 20^0, Determine the chordal height to which the gear tooth caliper should be set during measurement. **(03)**