

MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

A Constituent Institution of Manipal University

V SEMESTER B.TECH. (AUTOMOBILE ENGINEERING) END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: MEASUREMENTS & METROLOGY [AAE 3154]

REVISED CREDIT SYSTEM (03/12/2016)

Time: 3 Hours MAX. MARKS: 50 Instructions to Candidates: ✤ Answer ALL the questions. ✤ Missing data may be suitable assumed. Draw Sketches using **PENCIL** only. (03) **1A.** Sketch and explain the imperial standard yard. 1B. List and Explain the steps involved in the evaluation of limits and fits. (02) **1C.** Contrast the characteristics of Line and End Standards. (05) (03) **2A.** Calculate the length of base tangent over 3 teeth for helical gear having the following specifications; width of the gear=35mm, No. of teeth:12, helix angle is 28°, pressure angle= 18°, Module=4 mm. 2B. Sketch and Explain the working principle of Mechanical Optical Comparator, (02) and give the magnification factor for the same. **2C.** Design a general type of GO and NO GO gauge for components having 35 (05) H7/d9 fit. Given that I. Upper deviation of shaft = $-16 D^{0.44}$ II. Diameter step: 30-40 mm III. IT7 = 16i

IV. IT9 = 40i

3A. Discuss the following Back pressure gauges:

(03)

- a) Differential back pressure
- b) Venturi back pressure
- **3B.** Calculate the range of linear measurement, measuring head sensitivity, **(05)** pneumatic sensitivity and overall magnification for the pneumatic comparator

for functional pressure range of 0.6< **p/P**< 0.8. where

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

- **3C.** Define geometrical tolerances. Explain its types.
- **4A.** Effective diameter of 32*2.5 mm pitch metric plug screw gauge. For this **(05)** purpose, the following readings were noted.
 - i) Micrometer reading over the standard cylinder of 30.45mm and the wires of 0.002 m diameter as 13.4567mm.
 - ii) Micrometer reading over the gauge and wires as 12.2428mm.

Calculate the effective diameter considering the rake correction and the compression correction, assuming a measuring force of 3 N.

- **4B.** Why is the assessment of surface texture important? Describe a method to **(02)** obtain a numerical value of the texture from a graphical method.
- **4C.** Sketch and explain the construction and working of The Mcleod Gauge. **(03)**
- 5A. A metric screw thread is being inspected using the two-wire method to (02) measure its effective diameter and the following data is generated: Pitch=1.05 mm, diameter of the best size wire= 0.556mm, and the distance over the wires = 22.08 mm. Determine the effective diameter of screw thread.
- **5B.** Explain the working of Analytical balance and produce the equation for **(03)** sensitivity.
- **5C.** Obtain the expression for gear tooth measurement by Base tangent method. **(05)**

(02)