U.S.N | | | | | | | | | |

P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)
Fourth Semester, B.E. - Mechanical Engineering
Semester End Examination; June/July - 2015
Mechanical Measurements and Metrology

Time: 3 hrs   *Max. Marks: 100*

Note: i) Answer **FIVE** full questions, selecting **ONE** full question from each **Unit**.
     ii) Assume suitable missing data if any.

UNIT - I

1. a. Describe the different mode of operations of measuring instruments.   6

   b. Discuss the different types of systematic errors.   6

   c. With neat sketches explain linearity and Hysteresys in measuring instruments.   8

2 a. Differentiate between line and End standards   6

   b. Three 200 mm gauges to be calibrated are measured on a level comparator by wringing them together and then comparing them with a 600 mm gauge. The 600 mm gauge has an actual length of 600.0025 mm and the three gauges together have a combined length of 600.0035 mm. When the three gauges are inter compared, it is found that gauge A is longer than gauge B by 0.0020 mm but shorter than C by 0.001 mm. Determine the length of each gauge.   10

   c. Discuss repeatability errors associated with measuring instruments.   4

UNIT – II

3 a. Discuss How selective assembly concept can be applied to piston and cylinder assembly.   6

   b. Design the general type of GO and NOTGO gauges as per the present British system for a 40mm shaft and hole pair designated as 40H8/d9 given that

   i) $i = 0.453\sqrt[3]{D} + 0.001D$

   ii) 40 mm lies in the diameter range of 30 - 50 mm

   iii) IT8 = 25i

   iv) IT9 = 40i

   v) upper derivation of shaft $= -16D^{0.44}$

   vi) Wear allowance assumed to be 10% of gauge tolerance.

   Also show the disposition of tolerances also.   14

4 a. With sketches explain accumulation of tolerances and how it can be eliminated.   6

b. Determine the actual dimensions to be provided for a shaft & hole of 90 mm size for H8e9 shaft type clearance fit given.

i) $i = 0.453\sqrt[3]{D} + 0.001D$

ii) IT8=25 i and IT9 = 40 i

iii) 90mm falls in the diameter steps of 80 and 100 mm

iv) fundamental deviation for e type shaft is $= -11D^{0.41}$

Also design s Go and NOGO gauge taking wear allowance as 10% of gauge tolerance, as per the present British system.

14

UNIT – III

5 a. With a neat sketch explain the following :

i) Johanson Mikrokator   (ii) Back Pressure Gauge

12

b. Describe Taylor-Hobson Talysurf with a neat sketch.   8

6. a. Discuss how increase in angle being set influences the accuracy of measurement in sine bar.   7

b. Define & derive an expression for best size wire.   7

c. Explain the following methods of quantifying surface roughness:

(i) R_2 value   ii) RMS value   (iii) R_a value

6

UNIT – IV

7 a. With an appropriate example discuss primary secondary transducers.   6

b. Derive an expression for determining the sensitivity of Ballast circuit   8

c. Briefly explain the working principles of an oscillograph.   6

8 a. Explain a single stage electronic amplifier with a neat circuit.   6

b. What is telemetry? With a neat diagram discuss the working of a telemetry system.   8

c. List the quality attributes for transducers.   6

UNIT – V

9 a. Explain the working of a proving ring with a neat sketch.   6

b. What is a gauge factor? Deduce an expression for gauge factor.   8

c. With a neat diagram explain the construction and working of a resistance thermometers.   6

10 a. Discuss the working of a Pirani gauge with a next diagram.   6

b. Describe the following :

i)   Preparation and mounting of strain gauges.

ii) Thermo couple materials.

8

c. With a neat sketch explain the working of a hydraulic dynamometer.   6

＊ ＊ ＊ ＊ ＊