U.S.N

P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belagavi)
Second Semester, M. Tech - Mechanical Engineering (MCIM)
Semester End Examination; May / June - 2019
Metrology and Computer Aided Inspection

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. With an example, discuss why progressive dimensioning from a common reference line or base line dimensioning is adopted while specifying tolerances. — 8

b. Design the general type Go, Not-Go gauges for a component having 25 H_7/f_8. Being given with usual notations $i = 0.45\sqrt[3]{D} + 0.00\,D$, fundamental deviation of 'f' shaft = $-5.5\,D^{0.41}$, 25 mm falls in the diameter step of 18 and 30. Take wear allowance as 10% of the gauge tolerance and also determine; — 12

   i) Type of fit   ii) Allowance for the above fit

Sketch the fit and show these upon the actual dimensions of hole and shaft.

2 a. Explain the classification of pitch errors in screw threads. — 8

b. Discuss with a neat sketch plate snap gauge and rib type snap gauges. — 8

c. Write a note on Interchangeability. — 4

UNIT - II

3 a. Explain the following tests for checking rotation : — 8

   i) Run out   ii) Periodical axial slip

b. Explain the following surface roughness parameters with sketch : — 12

   i) R_a ii) R_t iii) R_z iv) R_{rms}

4 a. Describe the four reference circles used in measurement of roundness. — 12

b. Describe a method to find out flatness of a surface plate. — 8

UNIT - III

5 a. Explain any three alignment tests performed on lathe with a simple sketch. — 12

b. Discuss any two types of Contact and Non-contact probes used in CMM. — 8

6 a. Explain briefly the tool wear measurement using microscope. — 8

b. Describe the following tests that are carried out on milling machines with sketches : — 12

   i) Axial slip of a spindle

   ii) True running of inner taper of spindle

   iii) Parallelism of work table surface of spindle axis

UNIT - IV

7 a. Discuss the various stages involved in the operation of a machine vision system. 10

b. Explain the following with sketches :

   i) Laser scanning gauge 10

   ii) Gauging wide diameter from the diffraction pattern formed in a laser

8 a. Explain shape identification and edge detection techniques of machine vision system. 10

b. With a neat sketch, explain the measurement of surface roughness using machine vision system. 10

UNIT - V

9 a. Discuss the possible factors which could contribute significantly to the uncertainty of measurement in CMM. 8

b. Discuss the steps involved in the calibration of universal microscope. 12

10 a. Discuss the important considerations for the design of automatic gauging systems with suitable sketches. 10

b. Explain the measurement of following limit gauges with suitable sketches :

   i) Taper plug gauges 10

   ii) Taper ring gauges

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