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

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, M. Tech - Mechanical Engineering (MMDN)

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<sub>7</sub>/f<sub>8</sub>. 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<sub>a</sub>    ii) R<sub>t</sub>    iii) R<sub>z</sub>    iv) R<sub>rms</sub>
- 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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