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

(An Autonomous Institution affiliated to VTU, Belgaum)

Second Semester, M. Tech - Mechanical Engineering (MCIM)
Semester End Examination; June - 2016
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) Missing data may suitably assume.

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. A clearance fit needs to be provided for shaft and bearing assembly designed $70H_9e_7$.

Given the following data check the type of fit obtained

70 mm falls in diameter steps 50 - 80 mm

IT 7 = 16i and IT9 = 40i

$i = 0.45\sqrt[3]{D} + 0.001D$

Fundamental deviation for 'e' shaft = $-11D^{0.41}$

Also show the disposition of tolerances. — 12

2 a. Explain the following with an example :

(i) Feature control frame

(ii) Maximum and minimum metal conditions

(iii) Compound tolerance. — 12

b. A steel shaft is made within limits on its diameter of 60.02 and 59.96 mm state the upper and lower limits of the bore size of a bush to give a maximum clearance of 0.10 mm and a minimum clearance of 0.02 mm. Sketch the arrangement. — 8

UNIT - II

3 a. Define and determine the Ra index number of surface for which the graph was drawn to a vertical magnification of 15,000 and a horizontal magnification of 100 and the areas above and below the data line were, — 8

| Above | 160 | 90 | 180 | 50 mm^2 |
| Below | 95 | 65 | 170 | 150 mm^2 |

Assume a sampling length of 0.8 mm. Also determine the approximate RMS value.

b. With an example high light various surface texture symbols with specifications. — 12

4	a.	What is cut off wave length? List the cut off lengths for some of the typical operations.	10
	b.	Explain the construction and working of Tomlinson surface meter.	10

UNIT - III

5	a.	Describe the following acceptance tests that are carried out on milling machines with sketches;	
		(i) Axial slip of a spindle	12
		(ii) True running of inner taper of spindle	
		(iii) Parallelism of work table surface to spindle axis.	
	b.	Explain the different probes used in CMM. Also discuss the calibration of probes.	8
6	a.	Discuss the typical hibroutiries used in CMM with sketches.	12
	b.	Explain the following tests carried out on pillar type drilling machine,	
		(i) Deflection of spindle	8
		(ii) Squareness of the spindle axis with table.	

UNIT - IV

7	a.	Discuss the various stages involved in the operation of a machine vision system.	12
	b.	Explain the following :	
		(i) Diffraction pattern Technique,	8
		(ii) Laser triangular sensors.	
8	a.	Explain with a neat sketch the working of a laser interferometer.	10
	b.	Discuss how robot can be interfaced with the image processing system with a neat sketch.	10

UNIT - V

9	a.	Discuss the following :	
		(i) Electronic gauging	10
		(ii) Measurement of limit gauges.	
	b.	Explain contact less three dimensional measurements by a laser system.	10
10	a.	Briefly explain the different sources of uncertainty in measurements.	10
	b.	Describe how length measurement uncertainty of CMM is carried out.	10

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