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

(An Autonomous Institution affiliated to VTU, Belagavi)

Third Semester, B.E. - Industrial and Production Engineering

Semester End Examination; Dec - 2017/Jan - 2018

Engineering Metrology

Time: 3 hrs

Max. Marks: 100

Note: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.

ii) Assume suitably missing data if any.

## UNIT - I

- 1 a. Explain briefly subdivision of standards. 6
- b. Three 100 mm end bars are measured on a level comparator by first wringing them together and comparing with a 300 mm bar. The 300 mm bar has known error of +40  $\mu\text{m}$  less than the 300 mm bar. Bar A is 18  $\mu\text{m}$  longer than bar B and 23  $\mu\text{m}$  longer than bar C. Find the actual length of each bar. 8
- c. Explain hole basis system and shaft basis system. 6
- 2 a. List the characteristics of line standards and end standards. 8
- b. Determine the dimensions of the shaft and hole for a fit  $30\text{H}_8/\text{d}_{10}$  and sketch the fit given the following data :
- Diameter 30 falls in the dia range 18-30 upper deviation for "d" shaft is  $-16\text{D}^{0.44}$
- $i = 0.45 \text{D}^{1/3} + 0.001 \text{D}$ . Tolerance for IT8 = 25i tolerance for IT10 = 64i. 12

## UNIT - II

- 3 a. Explain the classification of gauges. 6
- b. With a sketch, explain Taylor's principle for gauge design. 7
- c. With a neat sketch, explain sine centre working principle. 7
- 4 a. With a sketch, explain combination set. 8
- b. With a sketch, explain how do you check two planes one and two at  $90^\circ$  to each other? 12

## UNIT - III

- 5 a. List the basic requirements of comparators. 6
- b. With a neat sketch, explain Johansson Mikrokator (Mechanical Type). 10
- c. List the advantages of mechanical comparators. 4
- 6 a. Explain the principle of operation of optical flat with sketch. 10
- b. With a neat sketch, explain Zeiss-ultra optimeter. 10

## UNIT - IV

- 7 a. With a neat sketch, explain Tomlinson's surface meter. 10
- b. List and explain any four terms used to describe surface roughness. 10

- 8 a. With a neat sketch, explain Parkinson gear tester. 10
- b. With sketch, explain gear terminology. 10

**UNIT - V**

- 9 a. With a neat sketch, explain any two alignment tests conducted on milling machines. 10
- b. With a neat sketch, explain acoustic emission testing. 10
- 10 a. With a neat sketch, explain any two alignment test conducted on lathe. 10
- b. List the advantages of Ultrasonic testing. 5
- c. Explain the importance of NDT. 5

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