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10ME/AU42B

Fourth Semester B.E. Degree Examination, Dec.2015/Jan.2016

## Mechanical Measurements and Metrology

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

### PART - A

- 1 a. Define the term "metrology" as applied to engineering industry. State and explain the objectives of metrology. (06 Marks)
- b. Explain with an illustration how end standard can be derived from the line standards. (08 Marks)
- c. Build following dimensions using M112 set: i) 35.4875 mm, ii) 78.3665 mm. M112 slip gauge set contain following:

Ranges	Steps	Pieces
1.0005	-	1
1.001 - 1.009	0.001	9
1.01 - 1.49	0.01	49
0.5 - 24.5	0.5	49
25.0 - 100.0	25.0	4

(06 Marks)

- 2 a. What are the concepts of interchangeability and selective assembly? Which is advantageous? (06 Marks)
- b. Design the general type GO and NOGO gauges for the component having 25 H<sub>7</sub>/f<sub>8</sub> fit. Given the following with usual notations:
- i)  $i$  in microns =  $0.45 \sqrt[3]{D} \pm 0.001 D$
- ii) Upper deviation for f shaft =  $-5.5 D^{0.41}$  in microns
- iii) 25 mm falls in the diameter step of 18-30 mm. IT7 = 16i, IT8 = 25i.
- Take wear allowance as 10% of gauge tolerance. Name the fit and mention the allowances of above fit. (14 Marks)

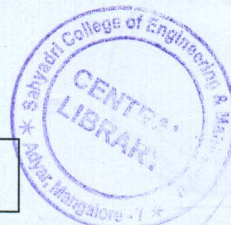
- 3 a. Explain with a neat sketch, construction and working of "Johnson Mikrokator" comparator. (08 Marks)
- b. Explain the principle and working of "Zeiss Ultra Optimeter" with a neat sketch. (08 Marks)
- c. Build an angle of 35°32'36" from the following set of angle gauges:
- Series I : 1°, 3°, 9°, 27° and 41°
- Series II : 1', 3', 9' and 27'
- Series III : 3", 6", 18" and 30". (04 Marks)

- 4 a. Explain the 3-wire method of finding the effective diameter of screw threads. (08 Marks)
- b. What is the principle of interferometry? How is it adapted in optical interferometer? (07 Marks)
- c. What are the uses of (i) sine centre, (ii) clinometers, (iii) angle gauges? (05 Marks)

### PART - B

- 5 a. Explain the following:
- i) Hysteresis
- ii) Accuracy and precision
- iii) Sensitivity
- iv) Repeatability and linearity (08 Marks)

Important Note : 1. On completing your answers, carefully draw diagonal cross lines on the remaining blank spaces.  
2. Any revealing of identification, appearance to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.



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- b. State the advantages of electric transducer over other transducers. (04 Marks)
- c. Discuss with a block diagram generalized measurement system with examples for each stage elements. (08 Marks)
- 6 a. Explain ballast circuit with a neat sketch. (06 Marks)
- b. Explain the working principle of CRO and give its applications. (10 Marks)
- c. State the advantages of electrical signal conditioning elements. (04 Marks)
- 7 a. Explain with a neat sketch, the working of hydraulic dynamometer. (10 Marks)
- b. Explain with a neat sketch, McLeod Vacuum gauge. (10 Marks)
- 8 a. What are the necessary precautions to be taken while mounting strain gauges? (06 Marks)
- b. Explain with a neat sketch any one type of mechanical strain gauge. (08 Marks)
- c. What is a thermocouple? State the laws of thermocouple. (06 Marks)

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