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10MEB402/10ME42B

Fourth Semester B.E. Degree Examination, June/July 2019
Mechanical Measurements and Metrology

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Draw neat sketches wherever necessary.

PART – A

1 a. What are airy points? Explain with an illustration. **(04 Marks)**

b. A calibrated metre end bar has an actual length of 1000.0003 mm. It is to be used in the calibration of two bars, A and B, each having a basic length of 500 mm. When compared with the metre bar $L_A + L_B$ was found to be shorter by 0.0002 mm. In comparing A with B it was found that A was 0.0004 mm longer than B. Find the actual length of A and B. **(08 Marks)**

c. Distinguish between a line standard and end standard with suitable example to each. **(04 Marks)**

d. Build up the following height using a M112 slip gauge set:
(i) 58.975 mm (ii) 29.8756 mm **(04 Marks)**

2 a. Define 'upper deviation', 'lower deviation', and 'fundamental deviation' with the help of a sketch. **(06 Marks)**

b. Determine the dimensions of hole and shaft for a fit $30H_8f_7$. The given data are : $i = 0.45D^{1/3} + 0.001D$, IT8 = 25i, IT7 = 16i. Fundamental deviation for shaft 'f' is $-5.5D^{0.41}$. 30 mm diameter lies in the diameter step of 18 - 30mm. **(08 Marks)**

c. What is a limit gauge? Explain the following gauges :
(i) Progressive plug gauge (ii) Snap gauge (iii) Screw thread gauge. **(06 Marks)**

3 a. Distinguish between a comparator and a measuring instrument. **(04 Marks)**

b. Describe a LVDT electrical comparator. **(06 Marks)**

c. Explain how do you measure the angle of a conical workpiece using sine centre. **(06 Marks)**

d. Build up the following angles using an usual 13 piece angle gauge set:
(i) 32° 15′ 33″ (ii) 54° 36′ 42″ **(04 Marks)**

4 a. What is an autocollimator? Explain the working principle of microptic autocollimator. **(08 Marks)**

b. Explain the determination of effective diameter of a screw thread by 2-wire method. **(08 Marks)**

c. Explain how do you measure gear tooth thickness using a gear tooth vernier. **(04 Marks)**

PART – B

5 a. What is measurement? Explain the stages of a generalized measurement system with a suitable example to each stage. **(08 Marks)**

b. Explain the following characteristics of a measuring instrument:
(i) Calibration (ii) Threshold value (iii) Loading effect (iv) Transfer efficiency **(04 Marks)**

c. Explain the following :
(i) Photoelectric transducer (ii) Electro kinetic transducer. **(08 Marks)**

6 a. List and explain the inherent problems in mechanical intermediate modifying devices. **(06 Marks)**

b. Explain the following :
(i) Ballast circuit (ii) Electronic amplifier. **(08 Marks)**

c. Sketch and explain a stylus oscillograph. **(06 Marks)**

7 a. Explain the following with sketches :
(i) Proving ring (ii) Pirani gauge. **(10 Marks)**

b. Explain with neat sketch prony brake dynamometer. What are its limitations? **(10 Marks)**

8 a. State and explain laws of thermocouple. **(06 Marks)**

b. What is pyrometry? Explain a radiation pyrometer. **(06 Marks)**

c. Explain the measurement of strain in a beam subjected to tension using resistance bridge. Use a compensating gauge. **(08 Marks)**

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