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15AE36

Third Semester B.E. Degree Examination, June/July 2017
Measurement & Metrology

Time: 3 hrs.

Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. What is metrology? List objectives of metrology. (08 Marks)
b. Four length bars A, B, C and D each having basic length 125 mm are to be calculated using a calibrated length bar of 500 mm basic length. The 500 mm bar has an actual length of 499.9991 mm. Also it is found that $L_B = L_A + 0.0001$ mm, $L_C = L_A + 0.0005$ mm, $L_D = L_A - 0.0002$ mm and $L_A + L_B + L_C + L_D = L + 0.0003$ mm. Determine L_A, L_B, L_C and L_D . (08 Marks)

OR

- 2 a. Describe with neat sketch international prototype meter. (08 Marks)
b. Build dimension of 78.3665 mm using M112 set slip gauge. (08 Marks)

Module-2

- 3 a. Discuss hole based and shaft based system of fit. (08 Marks)
b. Calculate all the relevant dimensions of 35 H_7/f_8 fit, dimension 35 fall in the step of 30-50 mm. Fundamental deviation for 'f' shaft is $-5.5D^{0.41}$. $S^0 = 0.45\sqrt[3]{D} + 0.001D$, $IT7 = 16 S^0$, $IT8 = 25 S^0$ (08 Marks)

OR

- 4 a. What are limit gauges? Sketch and explain any two types of plain plug gauges. (08 Marks)
b. Calculate the dimensions of plug and ring gauges to control the production of 50 mm shaft and hole pair of H_7d_8 as per IS specification. The following assumptions may be made : 50 mm lies in diameter step of 30 and 50 mm and upper deviation for 'd' shaft is given by $-16D^{0.44}$ and lower deviation for hole H is zero. Tolerance unit $i = 0.45\sqrt[3]{D} + 0.001D$ and $IT6 = 10i$ and above $IT6$ grade the tolerance magnitude is multiplied by 10 at each fifth step. (08 Marks)

Module-3

- 5 a. With neat sketch describe the construction and working of sigma comparator. (08 Marks)
b. Explain with sketch measurement of unknown angles of heavy components using sine bar. (08 Marks)

OR

- 6 a. Explain with a schematic diagram, the method of measuring the major diameter of a screw thread using bench micrometer. (08 Marks)
b. Derive an expression for measurement of effective diameter for 2 wire method of screw thread measurement. (08 Marks)

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

Module-4

- 7 a. Discuss with block diagram, generalized measurement system with examples for each stage elements. (08 Marks)
b. Explain with sketches,
(i) Hysteresis (ii) Threshold (iii) Repeatability (iv) Calibration. (08 Marks)

OR

- 8 a. What is thermistor? With sketch explain their construction. (08 Marks)
b. With a sketch, explain piezoelectric transducer. (08 Marks)

Module-5

- 9 a. Explain with a neat sketch the analytical balance. (08 Marks)
b. Describe with a neat sketch McLeod vacuum gauge. (08 Marks)

OR

- 10 a. What is thermocouple? State and explain law of thermocouple. (08 Marks)
b. Explain with neat sketch calibration of strain gauges. (08 Marks)

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