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06ME42B

Fourth Semester B.E. Degree Examination, June 2012

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 metre in terms of wavelength standards and discuss the important features of wavelength standards. (04 Marks)
- b. Describe with neat sketches:
 - i) Imperial yard standard.
 - ii) International prototype meter. (08 Marks)
- c. Using M112 set of slip gauges, build the following dimensions: (08 Marks)
 - i) 49.3115
 - ii) 68.208
- 2 a. With the help of neat sketch, differentiate the following:
 - i) Allowance and tolerance.
 - ii) Maximum material limit and minimum material limit.
 - iii) Clearance fit and interference fit. (06 Marks)
- b. Explain 'hole' based and 'shaft' based limit of fits. (08 Marks)
- c. Determine the actual dimensions to be provided for a shaft and hole of 90 mm size for H₈d₉ type clearance fit. Size 90 mm falls in diameter steps of 80 and 100. Value of tolerance unit $i = 0.45(\sqrt[3]{D}) + 0.001D$. Value of tolerance for IT8 and IT9 grades are 25*i* and 40*i* respectively. Value of fundamental deviation for 'd' type shaft is $-16D^{0.44}$. (06 Marks)
- 3 a. Give a brief note on essential characteristics of a good comparator. (06 Marks)
- b. Sketch and explain the working of Johanson's Mikrokator. (08 Marks)
- c. What is the maximum angle for which the sine bar can be set without sacrificing accuracy? Justify your answer. (06 Marks)
- 4 a. Explain the principle of 'interferometry'. (04 Marks)
- b. Explain the 3 wire method of measuring effective diameter of a screw thread, with the help of a suitable sketch. (10 Marks)
- c. Explain the procedure to measure gear thickness using gear tooth Vernier Caliper. (06 Marks)

PART – B

- 5 a. What are the causes of error in measurement? Give the detailed classification of errors. (10 Marks)
- b. Define the following terms:
 - i) Hysteresis
 - ii) Calibration
 - iii) Repeatability
 - iv) Threshold (06 Marks)
- c. With reference to transducers discuss the significance of following terms:
 - i) Transfer efficiency
 - ii) Sensitivity (04 Marks)
- 6 a. With neat sketch, explain ballast circuit. (08 Marks)
- b. With a block diagram, explain the functioning of telemetering transmitting and receiving system. (06 Marks)
- c. With block diagram, explain the working of x-y plotters. (06 Marks)

- 7 a. Explain briefly proving ring. (06 Marks)
b. With neat sketch, explain the working principle of Mcleod gauge. (06 Marks)
c. Sketch and explain the procedure for torque measurement using prony brake dynamometer. (08 Marks)
- 8 a. With the aid of a neat sketch explain how strain in a machine element subject to tensile load can be measured using electrical resistance strain gauges. Use a compensation gauge also. (10 Marks)
b. Explain the working of optical pyrometer and its application. (06 Marks)
c. Write a brief note on “mounting of strain gauges”. (04 Marks)

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