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Third Semester B.E. Degree Examination, June/July 2016
Mechanical Measurements & Metrology

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting
atleast TWO questions from each part.**

PART – A

- 1 a. Define 'Metre' and 'Yard' according to wavelength standards. List the advantages of wavelength standard. (08 Marks)
- b. Compare the characteristics of line standards and end standards based on an example for each. (06 Marks)
- c. What are airy points? Calculate the distance between two airy points for an 'Imperial Standard yard' and 'International prototype metre'. (06 Marks)
- 2 a. Explain the following showing the designation of each:
i) Clearance fit ii) Interference fit iii) Transition fit (12 Marks)
- b. Determine the tolerances on the hole and the shaft for a fit designated by $50H_7g_6$ and sketch the fit. Given i) 50 mm lies between $30 - 50$ mm ii) $i(\text{microns}) = 0.45(D)^{1/3} + 0.001 D$
iii) Fundamental deviation for 'H' hole = 0 iv) Fundamental deviation for 'g' shaft = $- 2.5D^{0.34}$. v) IT7 = 16i and IT6 = 10i. (08 Marks)
- 3 a. What are the accuracy requirements of a sine bar? Calculate the height of slip gauges to be built up from M12 set to locate 200 mm sine bar at 16° . Use 2 protector slip gauges of 2.5 mm. (08 Marks)
- b. Explain the principle of mechanical-optical comparator with suitable sketch. Write the formulae for mechanical, optical and overall magnification of such systems. (08 Marks)
- c. Explain the principle of Back pressure gauges with a sketch. (04 Marks)
- 4 a. Explain the formation of interference bands using an optical flat. (05 Marks)
- b. Explain the process of measurement of major diameter from a Bench micrometer. (05 Marks)
- c. Derive an expression for chordal thickness and chordal addendum of a gear tooth in terms of module and number of teeth of the gear. (10 Marks)

PART – B

- 5 a. Define the terms 'Accuracy' and 'Precision'. With the help of a schematic diagram and example, explain the following characteristics of a measuring instrument:
i) Precise but not accurate ii) Accurate but not precise iii) Accurate and precise. (12 Marks)
- b. Differentiate between the following :
i) Primary and secondary transducers ii) Active and passive transducers.
Give an example for each. (08 Marks)
- 6 a. With a schematic diagram, explain Ballast circuit. (08 Marks)
- b. Explain the inherent problems of mechanical intermediate modifying systems. (08 Marks)
- c. Write a note on Telemetry. (04 Marks)

- 7 a. Explain the working of an analytical balance with a sketch. Define sensitivity of the balance. Show that sensitivity of an analytical balance is independent of the weight being compared but depends on the construction parameters of balance. (12 Marks)
- b. Explain measurement of vacuum pressure using thermal conductivity gauge. (08 Marks)
- 8 a. Explain the laws of thermocouples and write the classification of thermocouple materials. (10 Marks)
- b. Explain with neat sketches the construction and working of disappearing filament pyrometer. (10 Marks)

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