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**Fourth Semester B.E. Degree Examination, December 2010**  
**Mechanical Measurements and Metrology**

Time: 3 hrs.

Max. Marks:100

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

**PART – A**

- 1 a. What are the objectives of metrology? What is the necessity of standard for measuring system? (06 Marks)
- b. What is an end standard. Using M112 standard slip gauge set, build 48.3275 mm. (06 Marks)
- c. Briefly explain : i) International prototype meter ; ii) Reference standard ; iii) Wringing phenomenon ; iv) Significance of wavelength standard. (08 Marks)
- 2 a. Differentiate between : i) Hole basis and shaft basis system ; ii) Clearance fit and interference fit ; iii) Measuring device and gauge. (06 Marks)
- b. What are the concepts of interchangeability and selective assembly? Which is advantageous? (06 Marks)
- c. Determine the dimensions of shaft and hole for a fit 30 H<sub>8</sub>/f<sub>7</sub>. The given data are :  
 $i = 0.45 \sqrt[3]{D} + 0.001D$   
 $IT8 = 25i, IT7 = 16i.$   
 Fundamental deviation for 'f' shaft  $- 5.5D^{0.41}$ . Also design PLUG gauge to check the above hole. Take wear allowance as 10% gauge allowance. (08 Marks)
- 3 a. What are the needs and characteristics of comparator? (06 Marks)
- b. What are the advantages of optical comparator over mechanical and pneumatic comparator? (06 Marks)
- c. What is the principle by which an electrical comparator works? Explain briefly the construction and working of LVDT as a comparator. (08 Marks)
- 4 a. What is the principle of interferometry? How is it adopted in optical interferometer? (06 Marks)
- b. What are the uses of i) Sine center ; ii) Clinometer ; iii) Angle gauges. (06 Marks)
- c. Explain briefly the feature that can be measured by optical flat and gear tooth vernier caliper. (08 Marks)

**PART – B**

- 5 a. Define : i) Calibration ; ii) Hysteresis ; iii) Loading effect. (06 Marks)
- b. Differentiate : i) Sensor and transducer ; ii) Primary and secondary transducer ; iii) Accuracy and sensitivity. (06 Marks)
- c. Explain the principle of resistance type and capacitive type electrical transducer. Name different types of electrical transducers. (08 Marks)
- 6 a. What is the necessity of modifying devices? What are the advantages of electrical modifying devices? (06 Marks)
- b. Why an input circuitry is required? Explain briefly the ballast circuit. (06 Marks)
- c. Explain briefly the working of analog electric meter indicator and x – y plotter. (08 Marks)
- 7 a. Briefly explain how pressure can be measured with elastic transducer. (06 Marks)
- b. Explain one indirect method of force measurement. (06 Marks)
- c. Explain briefly the working principle of eddy – current dynamometer. What are its advantages? (08 Marks)
- 8 a. Explain the working principles of radiation pyrometer and thermocouple. (08 Marks)
- b. Write notes on : i) Thermocouple Material ; ii) Strain gauge factor ; iii) Strain gauge material. (12 Marks)

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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.

