

**B.Tech. - VIEP - MECHANICAL ENGINEERING
(BTMEVI)**

Term-End Examination

December, 2018

00163

BIME-019 : METROLOGY

Time : 3 hours

Maximum Marks : 70

Note : Attempt any *five* questions. All questions carry equal marks. Use of scientific calculator is permitted.

1. (a) What are primary, secondary and tertiary measurement systems ? Explain with one example of each. 7
- (b) Sketch vernier caliper showing main scale and vernier scale. Define least count of a vernier caliper. Explain how diameter of a bar is measured with the help of vernier caliper. 7
2. (a) Distinguish between accuracy and precision. Which of these are more desirable during the act of measurement ? 7
- (b) Explain the functions of sensing element, signal conditioner and indicating element of a measuring instrument. 7

3. (a) The discharge coefficient C_d of an obstruction flow meter can be found by collecting the water that flows through it during a time interval t when it is under a constant head h . The relation prescribing the discharge coefficient is

$$C_d = \frac{m}{tPA\sqrt{2gh}}$$

Assuming the following data, determine the % of error in C_d with its uncertainty :

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$$m = 400 \pm 0.25 \text{ kg}$$

$$h = 3.65 \pm 0.003 \text{ m}$$

$$s = 1000 \pm 0.1 \% \text{ kg/m}^3$$

$$t = 600 + 2 \text{ sec}$$

$$g = 9.807 \pm 0.1 \% \text{ m/sec}^2$$

$$d = 1.25 \pm 0.0025 \text{ cm}$$

- (b) Explain the difference between threshold and resolution with suitable example.

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4. (a) What is comparator ? Classify the different types of comparators. Describe the advantages and disadvantages.

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- (b) Explain the following :

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(i) Toolmaker's microscope

(ii) Workshop microscope

5. (a) Describe the "base tangent method" used for measuring gear tooth thickness. 7
- (b) Explain the causes of interference errors, giving at least two examples each of instrument interference and environment interference. 7
6. (a) Describe the construction and working of an auto-collimeter. 7
- (b) Describe how pitch of a screw thread can be measured on a pitch measuring machine. 7
7. Write short notes on the following : $4 \times 3 \frac{1}{2} = 14$
- (a) Working Standards
- (b) Fits and Tolerances
- (c) Ring Screw Gauges
- (d) Multiple Sampling Plan
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