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18ME46B/18MEB406

**Fourth Semester B.E. Degree Examination, July/August 2022**  
**Mechanical Measurements and Metrology**

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

**Module-1**

- 1 a. Explain international prototype meter with a neat sketch. (06 Marks)
- b. Four length bars A, B, C and D each having a basic length 125 mm are to be calibrated using a calibrated length bar of 500 mm basic length. The 500 mm bar has an actual length of 499.9991 mm. Also, it was found that
- $$L_B = L_A + 0.0001 \text{ mm}$$
- $$L_C = L_A + 0.0005 \text{ mm}$$
- $$L_D = L_A - 0.0002 \text{ mm}$$
- and  $L_A + L_B + L_C + L_D = L + 0.0003 \text{ mm}$
- Determine  $L_A$ ,  $L_B$ ,  $L_C$  and  $L_D$  (08 Marks)
- c. Define a standard. Write a note on wavelength standards. (06 Marks)

**OR**

- 2 a. Explain sine centre with a neat sketch. (06 Marks)
- b. Explain the principle and construction of Auto collimator with a neat diagram. (14 Marks)

**Module-2**

- 3 a. Define the terms :
- (i) Limits (ii) Fits (iii) Fundamental deviation (iv) Tolerance  
(v) Allowance (vi) Basic size (06 Marks)
- b. Determine the actual dimensions to be provided for a shaft and hole of 90 mm size for  $H_8C_9$  type clearance fit. Given Diameter steps are 80 mm and 100 mm,  
 $i = 0.45 \sqrt[3]{D} + 0.001D$ ,  
 Value of tolerances for IT8 = 25i and for IT9 = 40i  
 and Fundamental Deviation for 'C' type shaft  $F.D = -11 D^{0.41}$   
 and also design the GO and NOGO gauges, considering wear allowance. (14 Marks)

**OR**

- 4 a. Explain the construction and working of Sigma Comparator with a neat sketch. (10 Marks)
- b. Explain Solex Pneumatic Comparator with a neat sketch. (10 Marks)

**Module-3**

- 5 a. Explain Toolmaker's microscope with a neat sketch. (14 Marks)
- b. Define Best Size Wire. Derive an expression for the same. (06 Marks)

**OR**

- 6 a. Explain the measurement of gear tooth thickness using constant chord method. (10 Marks)
- b. Explain the Gear tooth Vernier Caliper with a neat sketch. (10 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. Explain Generalized measurement system with a Block Diagram. (12 Marks)  
b. Define : (i) Accuracy (ii) Precision (iii) Threshold (iv) Hysteresis (08 Marks)

**OR**

- 8 a. Define Transfer Efficiency. Explain Ionisation transducer with a neat sketch. (07 Marks)  
b. Classify Transducers. Explain Resistive transducers with a neat sketch. (13 Marks)

**Module-5**

- 9 a. Explain Equal arm balance for force measurement. (12 Marks)  
b. Explain Prony brake dynamometer with a neat sketch. (08 Marks)

**OR**

- 10 a. Explain Mc Leod gauge with a neat sketch. (10 Marks)  
b. Define thermocouple. State the laws of thermocouple and explain. (06 Marks)  
c. Explain the theory of strain gauges and define gauge factor. (04 Marks)

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