

# CBCS Scheme

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15AE36

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018

## Measurements and Metrology

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Define metrology and measurement. List some of the objectives of metrology. (06 Marks)  
b. Explain NPL method of deriving end standard from line standard with neat sketch. (10 Marks)

OR

- 2 a. Differentiate between line standard and end standard with examples. (06 Marks)  
b. Four length bars A, B, C, D of approximately 250 mm each are to be calibrated with standard calibrated meter bar which is actually 0.0008 mm less than a meter. It is found that bar "B" is 0.0002 mm longer than bar "A", bar "C" is 0.0004 mm longer than bar "A" and bar "D" is 0.0001 mm shorter than bar "A". The length of all four bars are put together is 0.0003 mm longer than the calibrated standard meter. Determine the actual dimension of each bar. (10 Marks)

### Module-2

- 3 a. Define the following terms:  
i) Compound tolerance  
ii) Interchangeability (04 Marks)  
b. Define fit and explain the following showing the designation of each:  
i) Clearance fit  
ii) Interference fit (06 Marks)  
c. Determine the type of fit after deciding the fundamental deviation and tolerances in the following:  
Fit  $\phi 70 H_9C_7$  diameter step (50-80)  
Fundamental deviation for e-shaft =  $-11D^{0.41}$   
IT7 = 16i      IT9 = 40i  
where,  $i = 0.453\sqrt[3]{D} + 0.001D$  (06 Marks)

OR

- 4 a. Explain Taylor's principle for the design of limit gauge. (06 Marks)  
b. Design the general type "GO" and "NOT GO" gauges for the component having  $25M_7/f_8$  fit. Given the following with usual notations:  
i)  $i(\mu) = 0.45\sqrt[3]{D} + 0.001D$   
ii) Upper deviation for "f" shaft =  $-5.5D^{0.41}$   
iii) 25 mm falls in the diameter step of 18-30 mm.  
Take wear allowance as 10% of gauge tolerance. Also determine:  
i) Type of fit  
ii) Allowance for the above fit. (10 Marks)

### Module-3

- 5 a. Explain need for a comparator. (04 Marks)  
b. Explain characteristics of comparator. (04 Marks)  
c. Explain in detail about ABRAMSON's Movement with neat sketch. (08 Marks)

OR

- 6 a. Explain the principle of Sine bar. (04 Marks)  
b. Describe the 3 wire method of:  
i) measuring effective diameter of thread  
ii) for Whitworth thread  
iii) for metric thread (12 Marks)

**Module-4**

- 7 a. Define and state the significance of following terms in measurement:  
i) Accuracy  
ii) Threshold  
iii) Mystersis (08 Marks)  
iv) Sensitivity (08 Marks)  
b. What is error? How errors are classified? Explain each type with examples. (08 Marks)

OR

- 8 a. Explain briefly about the classification of First Stage devices. (08 Marks)  
b. Explain any two methods of pressure sensitive elements. (08 Marks)

**Module-5**

- 9 a. Explain the following with neat sketch:  
i) Prony Brake Dynamometer (08 Marks)  
ii) Hydraulic Dynamometer  
b. Describe with a neat sketch of McLeod Vacuum gauge and explain its working principle. (08 Marks)

OR

- 10 a. What is thermocouple and state the laws governing the functioning of thermocouple. (08 Marks)  
b. Explain in brief about the construction and working of optical pyrometer with a neat sketch. (08 Marks)

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