

Printed Pages – 5

Roll No. :

337356(37)

B. E. (Third Semester) Examination, Nov.-Dec. 2021

(New Scheme)

(Mech. and Production Engg. Branch)

MECHANICAL MEASUREMENT & METROLOGY

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all questions. All the question carry equal marks. Part (a) of each question is compulsory. Attempt any two from the rest. Give suitable self-explanatory figures/ diagrams wherever required.

Unit-I

1. (a) Differentiate between 'precision' and 'accuracy'. 2
- (b) Enlist the principle elements of a generalized measurement system and discuss the static and

337356(37)

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[2]

dynamic performance characteristics of measurement instruments. 7

(c) Why calibrations of measuring instruments are needed? Further, explain the calibration procedure to calibrate a mechanical measurement instrument of your choice. 7

(d) How an error is defined? What are the various sources of errors? How the errors are recognised and analyzed for calibration purposes? 7

Unit-II

2. (a) What do you mean by 'absolute pressure' standard? 2

(b) What are the instruments used for low temperature measurements? Give their names and explain any one of them in detail with the help of diagram. 7

(c) Define the term 'total radiation'. In what conditions the total radiation can be obtained? And how the total radiation can be measured? 7

(d) Derive the following expression :

$$F = 1 + 2\mu + \frac{(d\rho/\rho)}{(dl/l)} \quad 7$$

[3]

Unit-III

3. (a) Define 'Seismic Vibration'. 2

(b) How the single and multi-channel Data Acquisition Systems differ from each other? Also discuss their advantages and disadvantages over and upon each other. 7

(c) Explain concept and working of ultrasonic flow meter measuring apparatus. Also give the advantages and application areas of this technique. 7

(d) Give short notes on the following :
(i) velocity measurement at a point in fluid flow by pitot static tube 3½
(ii) elements of microprocessor based data acquisition system. 3½

Unit-IV

4. (a) How 'Line Standard Measurement' differs from 'End Standard Measurement'? 2

(b) Define the followings geometric forms/textures and draw their symbolic representations : 7
(i) Straightness,

[4]

- (ii) Flatness,
 - (iii) Perpendicularity,
 - (iv) Parallelism,
 - (v) Concentricity,
 - (vi) Circularity,
 - (vii) Cylindricity
- (c) Explain the concept, working principle and fields of application of Autocollimator with the help of its explanatory diagram. 7
- (d) Give short notes on the following : 7
- (i) concept and applications of gauge blocks
 - (ii) advantages of sine-center over sine-bar

Unit-V

5. (a) What do you mean by pitch circle diameter on a gear tooth profile? 2
- (b) Explain the concept and working of a Mechanical Comparator giving diagram. 7
- (c) Explain the 'Three-Wire Method' for mean effective diameter measurement of a screw thread giving self-explanatory diagram. 7

[5]

- (d) Describe the working principle and applications of a Coordinate Measuring Machine (CMM). Also give the possible sources of errors in the measurement of physical and geometrical features of an object. 7