

GANPAT UNIVERSITY

B. Tech. Semester: V Mechanical Engineering

Regular Examination November – December 2015

2ME 505 MECHANICAL MEASUREMENT AND METROLOGY

Time: 3 Hours

Total Marks: 70

- Instruction:** 1 Attempt all questions.
 2 Assume suitable data if necessary.
 3 Figures to the right indicate full marks.
 4 Answers to the two sections must be written in separate answer books.

Section - I

- Que. – 1 (a) Define the term “Metrology” as applied to engineering industry. State its significance in modern industries. 4
 (b) Define the terms: 4
 (i) Calibration (ii) Readability
 (iii) Sensitivity (iv) Magnification
 (c) State the principle of Micrometer. Explain briefly the construction and use of outside micrometer with a neat sketch. 4

OR

- Que. – 1 (a) Differentiate between Line standards and End standards. Give their examples. 4
 (b) Why the slip gauges are termed as “End Standard”? State the meaning of wringing. What are the essential conditions for wringing of slip gauges? 4
 (c) Interpret the meaning and sketch the following fits: 4
 (i) 40 H8g7
 (ii) 25 F9d8

- Que. – 2 (a) Describe the working principle, advantages and disadvantages of Sigma comparator. 5
 (b) Calculate the limits and sizes for a clearance fit having basic size 25 mm with minimum clearance of 0.02 mm and maximum clearance of 0.04 mm. If the tolerance of hole is 1.5 times the shaft tolerance. Calculate the sizes if it is Hole basis system or it is Shaft basis system. 6

OR

- Que. – 2 (a) Explain with a sketch the three-wire method of measuring the effective diameter of a screw thread. How it differ from two-wire method? 5
 (b) Define the terms Allowances and Tolerances. Describe various types of fits in brief with neat sketches. 6

- Que. – 3 **Attempt All.** 12

- (a) Explain with the help of neat sketches the principle and construction of auto-Collimator.
 (b) Explain briefly the following terms.
 (i) Full Interchangeability
 (ii) Selective Assembly

- (c) Find the value of allowance and tolerances for hole and shaft assembly for the following dimensions of mating parts:

$$\text{Hole: } 30_{+0.00}^{+0.02} \text{ mm}$$

$$\text{Shaft: } 30_{-0.06}^{-0.01} \text{ mm}$$

- (d) Draw the conventional diagram of limits and fits and explain the terms:
(i) Fundamental deviation
(ii) Hole basis system
(iii) Shaft basis system

Section – II

- Que. – 4 (a) What is a tachometer? How are tachometers classified? Explain any one of them. 4
(b) Derive an Expression for rate of flow through Venturimeter. 4
(c) Describe the construction and working of a Rotameter. List its advantages and disadvantages. 4

OR

- Que. – 4 (a) Explain Hydraulic load cell and Pneumatic load cell in brief. 4
(b) What is the principle of McLeod Gauge? State its advantages and limitations. 4
(c) Explain Nutating disc meter and also give its advantages and disadvantages. 4

- Que. – 5 (a) Write short note 6
(i) Bourdon tube pressure gauge
(ii) Diaphragm gauge
(b) Explain briefly the construction and working of a thermocouple vacuum gauge. State its advantages and disadvantages. 5

OR

- Que. – 5 (a) Explain briefly the following dynamometers: 6
(i) Rope brake dynamometer
(ii) Prony brake dynamometer
(b) What are accelerometers? Discuss the construction and working of piezoelectric accelerometer and Seismic accelerometer. 5

- Que. – 6 Attempt All 12
(a) Explain the construction and working of Optical pyrometer.
(b) Differentiate between A.C. Tachometer and D.C. Tachometer.
(c) What is the difference between the “Rate meters” and “Quality meters”?
(d) Give the broad classification of temperature measuring instruments.

END OF PAPER