P P SAVANI UNIVERSITY

Fourth Semester of B. Tech. Examination

May 2019

SEME2070 Mechanical Measurement & Metrology

20.05.2019, Monday **Time: 09:00 a.m. To 11:30 a.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1 Answer the following (Any Five). **[05]**

(i) Precision is

(a) the repeatability of a measuring Process

(b) agreement of the result of a measurement with the true value of the measured quantity

(c) the ability of an instrument to reproduce same reading under identical conditions

(d) error of judgment in reading an observation

(ii) Give the concept of Repeatability and Reproducibility.

(iii) Write any two methods employed for measuring torque.

(iv) Profilometer is an instrument used to measure

(a) gear involute (b) thread profile

(c) taper (d) surface roughness

(v) Enlist types of strain guage.

(vi) Give the brief classification of gear.

(vii) What are optical flates?

Q - 2 (a) State necessity and objectives of metrology. Also explain in brief precision and accuracy. **[05]**

Q - 2 (b) What is an effective diameter of thread? Explain with neat sketch measurement of effective diameter by three wire method. **[05]**

OR

Q - 2 (a) Explain the construction and working of Johansson mikrokators mechanical comparator with neat sketch. **[05]**

Q - 2 (b) Describe a gear tooth Vernier calliper and explain its use for checking tooth thickness and depth of tooth. **[05]**

Q - 3 (a) Enlist and discuss the any five factors influence to produce rough surface during machining operations. **[05]**

Q - 3 (b) Define Straightness. Describe the method of straightness measurement by using slip guage. **[05]**

OR

Q - 3 (a) With neat sketch describe the construction working of Tomlinson surface roughness tester with its advantages and disadvantages. **[05]**

Q - 3 (b) Define Flatness and describe a method to find out the flatness of a surface plate. **[05]**

Q - 4 Attempt any one. **[05]**

(i) Describe with sketch eddy current dynamometer stating speed, power limit, advantages and limitations.

(ii) Explain the principle, working and method of speed measurement using Stroboscope stating an illustration.

SECTION – II

Q - 1 Answer the following (Any Five). **[05]**

(i) Sketch line diagram of generalized measurement system.

(ii) Define Threshold.

(iii) How to find least count of Vernier caliper?

(iv) State the applications of Coordinate Measuring Machines.

(v) A ratchet is provided in a micrometer. Give Reason.

(vi) Minimum number of slip should be used to build up the required dimension. Give Reason.

(vii) Explain concept of hysteresis by taking true value of 4.

Q - 2 (a) Compare: (i) a micrometer (ii) a Vernier calliper. **[05]**
With reference to : (a) ease of reading (b) range (c) accuracy (d) protection of dirt and damage (e) adjustment for wear.

Q - 2 (b) Suggest a complete instrumentation scheme to measure high temperature of furnace using thermocouple. **[05]**

OR

Q - 2 (a) A 200 mm sine bar is to be set up to an angle of 25°, Determine the slip gauges needed from 87 pieces set. **[05]**

(2) Set M 87 (special set)		
Range (mm)	Steps (mm)	No. of blocks
1.001 – 1.009	0.001	9
1.01 – 1.49	0.01	49
0.5 – 9.5	0.5	19
10 – 90	10	9
1.005	—	1

Q - 2 (b) Explain how sine bar is used to measure: **[05]**

I. Angle of component of small size

II. Angle of component of large size

Q - 3 (a) Mercury is used in Liquid-in-glass thermometer. – Give Five reasons. **[05]**

Q - 3 (b) Why micrometer is required to be tested for accuracy? State briefly the usual method of testing the accuracy of a micrometer. **[05]**

OR

Q - 3 (a) Explain total radiation pyrometer with neat sketch. **[05]**

Q - 3 (b) Explain different configuration of Coordinate Measuring Machines with its operation. **[05]**

Q - 4 Discuss your idea to integrate emerging area (IoT) and Metrology in the context of industry 4.0. towards smart factory. **[05]**

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