Government College of Engineering, Amravati
(An Autonomous Institute of Government of Maharashtra)

Fifth Semester B. Tech. (Mechanical Engineering)

Winter – 2016

Course Code: MEU504

Course Name: Metrology and Measurement System

Time: 2 ½ hours **Max. Marks: 60**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

1. **(a)** Distinguish between line measurement and end measurement. State two suitable measuring devices for each category of measurement. **6**

(b) Why the slip gauges are termed as end standards? Explain the method of making a required dimension with the help of slip gauge blocks. Why do we require **6**

OR

(c) Describe any one of the available mechanical comparators. How will you distinguish between 'mechanical' and 'optical-mechanical' comparators? **6**

2. (a) The Indian standard (IS: 919) is based on fundamental tolerance units i and the deviations corresponding to letter designation, for each range. The fundamental tolerance for quality IT 6 is 10 i and subsequent tolerance grades are based on R 5 series. For size of 35mm, i = 16 and the fundamental deviations for H and f are 0 and 25 respectively in units of 0.001 mm (or micron). Determine the limits of tolerances for a hole and shaft 35H8/f7. Draw a diagram for this fit and up to what range of size this diagram will be applicable and why? 6

(b) Describe with sketch the principle of auto – collimation. An autocollimator may be used for testing alignment at right angles to a datum. Show how this may be carried out and describe with the aid of sketches the accessories used. 6

OR

(c) How the tooth thickness of gear is measured in base tangent method? Derive the expression for tooth thickness of a gear in this method. 6

3. (a) Describe the two wire method of finding the effective diameter of screw threads. 6

(b) Define the following with respect to surface finish assessment and electronic stylus instruments

i. Roughness
ii. Waviness
iii. Lay

6

OR

(c) When measuring the effective diameter of an external screw thread gauge of 3.5mm pitch, a 30.500mm diameter cylindrical standard and 2.000mm wires were used. The micrometer

readings over the standard and wires and gauge and cylinders were 13.3768 and 12.2428 mm respectively. Calculate the thread gauge effective diameter 6

4. (a) Give the structure of Generalized Measurement System and Explain in detail 6

(b) Explain the method of measuring force using a strain gauge measuring cell. 6

5. (a) With a sketch explain the torque measurement using strain gauge 6

(b) With neat sketch explain in detail how bimetallic strips are used for temperature measurement 6

Explain vernier Caliper Construction & working.
Describe diff^n types of errors in measurement & their causes.

helical
spiral

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Fifth Semester B. Tech. (Mechanical Engineering)

Winter – 2017

Course Code: MEU504

Course Name: Metrology and Measurement System

Time: 2 Hrs. 30 Min. **Max. Marks: 60**

Instructions to Candidate

1) All questions are compulsory.
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4) Use of drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.
6) Diagrams should be neat & clean.

1	a	Define Metrology. What are the various objectives of Metrology?	6
	b	Explain the construction and working of CMM.	6
2		**Attempt any TWO**	
	a	Define the angular measurement. Explain the construction and working of Bevel type Protractor.	6
	b	Differentiate between Mechanical and Electrical comparators.	6
	c	Explain following terms related with Spur Gears. i) Run-out ii) Pitch iii) Profile iv) Backlash	6

3 **Attempt any TWO**

a Explain hole basis system and shaft basis system in details.

b Define General Configuration and Explain functional elements of Measurement system

c Explain measurement of thread diameter with std. wire and screw thread measurement.

4 **Attempt any TWO**

a Explain construction and working of Venturi meter. 6

b Why temperature measurement is necessary? Explain electrical resistant thermometer. 6

c Enlist the high pressure measurement devices. Describe Bourdon tube gauge. 6

5 a What are the various mechanical types of tachometers? 6

b Explain single float liquid level measurement system. 6

NQU19M

Government College of Engineering, Amravati
(An Autonomous Institute of Government of Maharashtra)

VI Semester B. Tech. (Mechanical)

Summer- 2009 (Make-Up Examination)

Course Code : ME603

Course Name : Metrology and Quality Control

Time : 2 Hrs 30 Min. **Max. Marks : 60**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

1. **Solve ANY TWO**

(a) What is Comparator? Classify the different types of Comparator. Also, explain the characteristics of Mechanical Comparator? **6**

(b) Describe with a neat sketch three wire method of measuring effective diameter of external thread? **6**

(c) Explain the Single and Double Sampling Plan. In which circumstances are they preferred? **6**

2. **Solve ANY TWO**

(a) What do you understand by Optimization of Quality of Design? Justify with help of graph? **6**

Contd..

(b) Name and explain with neat sketch a limit system suitable if the large number of shafts and holes are received from different sources? 6

(c) Explain any three types of pitch errors which may occur on the screw thread? 6

3. What is meant by Statistical Quality Control? State clearly the assumptions behind the control chart technique. 4+8

The following data shows the values of sample mean and range for 10 samples of size 5 each. Calculate the values for center line and control limits for mean chart and range chart and determine whether the process is under control or not? (For $n=5$, $A_2=0.577$, $D_3=0$, $D_4=2.115$)

Sample No.	1	2	3	4	5
X	11.2	11.8	10.8	11.6	11.0
R	7	4	8	5	7

Sample No.	6	7	8	9	10
X	9.6	10.4	9.6	10.6	10.0
R	4	8	4	7	9

4. **Solve ANY TWO**

(a) What is the importance of Interchangeability and selective assembly with respect to an engineering assembly such as a motor cycle? 6

(b) What do you understand by Constant Chord setting? Calculate the chord length and its 6

distance below the tooth tip for a gear of module 2.5mm and pressure angle 20^0.

(c) Explain with a neat sketch the principle of working of an Auto-collimeter. Also describe how it is used in measuring straightness of a surface. 6

Solve ANY TWO

5. (a) Draw an Operating Characteristics Curve. Indicate and explain briefly the four parameters of OC curve? 6

(b) Name and explain the different the devices used for the measurement of Circularity? 6

(c) What is the difference between Unilateral and Bilateral tolerances? Why are unilateral tolerances preferred over bilateral tolerances? 6

19

22/4/10

NQU10

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

VI Semester B. Tech.(Mechanical)

Summer - 2010

Course Code : ME603

Course Name : Metrology & Quality Control

Time : 2 hr.30min. **Max. Marks : 60**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

1. Solve ANY TWO

(a) Explain the following terms: 6
(i) Concentricity of teeth (ii) Run Out
(iii) Backlash

(b) Define Flatness and Parallelism. Describe any one method of testing flatness of a surface? 6

(c) Name and explain with neat sketch a limit system suitable if the large number of shafts and holes are received from different sources? 6

2. Solve ANY TWO

(a) Discuss the advantages and limitations of Vernier Caliper, Micrometer and Dial Gauge? 6

Contd..

19

22/4/10

NQU10

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

VI Semester B. Tech.(Mechanical)

Summer - 2010

Course Code : ME603

Course Name : Metrology & Quality Control

Time : 2 hr.30min. **Max. Marks : 60**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
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2. Solve ANY TWO

(a) Discuss the advantages and limitations of Vernier Caliper, Micrometer and Dial Gauge? 6

Contd..

(b) What is the concept of Cost of Quality? Explain the various elements of Quality Function. 6

(c) Explain the following terms used in acceptance sampling. 6

(i) Single Sampling (ii) Double Sampling
(iii) Sequential Sampling

3. Explain the term Statistical Quality Control. How is the process control achieved with the help of control charts? 4+8

Construct a control chart for mean and the range for the following data on the basis of fuses, samples of 5 being taken every hour(each set of 5 has been arranged in ascending order of magnitude) Assume $A_2=0.58$, $D_4=2.11$, $D_3=0$

Sample No.	Sample Observations				
1	42	65	75	78	87
2	42	45	68	72	90
3	19	24	80	81	81
4	36	54	89	77	84
5	42	51	57	59	78
6	51	74	75	78	132
7	60	60	72	95	138
8	18	20	27	42	60
9	15	30	39	62	84
10	69	109	113	118	153
11	64	90	93	109	112
12	61	78	94	109	136

4. **Solve ANY TWO**

(a) What is Comparator? Explain with a neat sketch the backpressure concepts in Pneumatic Comparators? 6

(b) Describe the following: 6
(i) Slip Gauge (ii) Angle Gauge
(iii) Combination set

(c) State the various sources of errors in manufacturing gears by reproducing method and generating method? Explain any one in detail. 6

5. **Solve ANY TWO**

(a) What are the various methods used for squareness testing? Explain Engineer's square tester in detail. 6

(b) Describe with a neat sketch three wire method of measuring effective diameter of external thread? 6

(c) Explain the following terms used in operating characteristics curve. 6
(i) Producer's Risk (ii) Consumer's Risk
(iii) Acceptance Quality Level