

Seat  
No.

--	--	--	--	--	--



मठ - 035

## Mech. Measurement and Metrology (1110)

P. Pages : 3

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory. Solve **any two** bits out of a, b, c in each question.
5. Draw neat sketches wherever necessary.
6. Assume suitable data if necessary.
7. Use of electronic non-programable pocket calculator is allowed.

### UNIT - I

1. a) What are primary, secondary & tertiary (territory) measurements ? Explained with examples. 10  
b) Explain the different static characteristics of an instrument. 10  
c) Write short note on : 10  
i) Selection criteria of transducers.  
ii) XY recorder.

### UNIT - II

2. a) Why is a rotameter called variable area meter ? Describe with neat sketch rotameter to measure flow of fluid. Also state the requirements of float used in rotameter. 10  
b) i) Write short note on : Hydraulic load cell. 5  
ii) A  $100\Omega$  strain gauge is bonded to a low carbon steel bar which has been subjected to a tensile load. The bar has a preload uniform cross sectional area of  $0.5 \times 10^4 \text{ m}^2$  & Young's modulus for low carbon steel is  $200 \text{ GN/m}^2$ . If a load of 50 kN produces a change of  $1\Omega$  in the strain resistance. Determine gauge factor for the strain gauge. 5

- c) Describe the construction & working of 10  
 i) Total radiation pyrometer.  
 ii) Infrared pyrometer.

### UNIT - III

3. a) i) Distinguish between line standard & end standard. Give their examples. 5  
 ii) State alignment tests for lathe machine. 5
- b) Determine the tolerances on the hole & the shaft for a precision running fit. designated by  $50H_7 / g_6$  Being given the following notations: 10
- i)  $i$  (microns) =  $0.46(D)^{1/3} + 0.001D$  (where  $D$  in mm)  
 ii) Fundamental deviation for 'H' hole = 0  
 iii) Fundamental deviation for 'g' shaft =  $-2.5 \times D^{0.34}$   
 iv)  $IT_7 = 16i$ ,  $IT_6 = 10i$ .  
 v) 50 mm lies between 30 – 50 mm.  
 State the actual maximum & minimum sizes for both the hole & shaft. Also maximum & minimum clearances.
- c) i) What is comparator ? State the essential characteristics of a good comparator. 5  
 ii) Explain with neat sketch electrical comparator. 5

### UNIT - IV

4. a) Describe with neat sketch angle dekkor. Give it's applications. 10
- b) i) Calculate the CLA (Ra) value of a surface for which the sampling length was 0.8 mm. The length was drawn to a vertical magnification of 10,000 & horizontal magnification of 100 & areas above & below the datum line were. 5
- Above – 150 80 170 40 mm<sup>2</sup>  
 Below – 80 60 150 120 mm<sup>2</sup>.

- ii) What is best size wire ? Derive an expression for the best size wire. 5
- c) i) Explain two wire method of checking effective diameter of screw thread. 5
- ii) Calculate the gear tooth caliper settings to measure the chordal thickness of a gear of 45 teeth having a module of 4 mm. 5

### UNIT - V

5. a) Explain with neat sketch computer controlled co-ordinate measuring machine (CMM). Give it's advantages. 10
- b) A component with specification limits as given as  $40.37 \pm 10$  while inspection. The components were taken in subgroups of 5 items 10 such subgroups were checked. The  $\bar{X}$  & R values were noted as follows: 10

Subgroup no.	1	2	3	4	5	6	7	8	9	10
$\bar{X}$	34	30.8	35	33	33.8	35.8	34	33.8	31.8	33
R	4	2	5	5	19	4	14	7	9	5

Establish the control limits for  $\bar{X}$  & R charts. Draw the charts & tell whether the product will meet the specifications or. not. How much is process capability for subgroup size 5 ? Take  $A_2 = 0.577$ ,  $D_3 = 0$ ,  $D_4 = 2.115$ .

- c) i) State the characteristics of good sampling plan. 5
- ii) Write short note on : six sigma. 5

\*\*\*\*\*