Seat No. | | | | | | |

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CBI1330

Mechanical Measurement and Metrology (New) (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 programmable pocket calculator is allowed.

UNIT - I

1. a) Explain the terms : **10**

i) Accuracy

ii) Precision

iii) Readability

iv) Speed of response

v) Overshoot.

b) i) What is error? Distinguish between systematic and random errors. **5**

ii) Explain the different points to be considered for selecting transducers. **5**

c) Explain with neat sketch computer based data acquisition system. **10**

UNIT - II

2. a) Explain in brief : **10**

i) Prony brake dynamometer.

ii) Analytical balance.

b) i) Explain with neat sketch thermal conductivity gauge. **5**

ii) A 100Ω 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 $0.5\times10^{4}m^{2}$ & Young's modulus for low carbon steel is $200GN/m^{2}$. If a load of 50KN produces a change of 1Ω in the gauge resistance, determine the gauge factor for the strain gauge. **5**

c) What are different types of pyrometers ? Explain briefly any two of them with a neat diagram. **10**

UNIT - III

3. a) i) Distinguish between line standard & end standard. Give their examples. **5**

ii) Explain in brief & give examples of following methods of measurement. **5**
- a) Direct method
- b) Indirect method
- c) Contact method
- d) Deflection method
- e) Comparative method.

b) Design the "general" type 'Go' & 'NOGO' gauges for components having $90H_{8}eg$ type fit. Being given with usual notations : **10**

i) i (microns) $0.45\sqrt[3]{D}+0.001D$ (D in mm)

ii) Fundamental deviation for 'e' type shaft = $-11D^{0.41}$

iii) The values of tolerances $IT_{8} = 25$ i & $IT_{9} = 40$i.

iv) Size 90mm falls in diameter step of 80 & 100. Take wear allowance as 10% of gauge maker's tolerance. Also determine the type of fit.

c) i) State the essential conditions for interference of light. By using optical flat & monochromatic light explain the procedure to determine whether the given surface is flat, concave or convex. **5**

ii) Describe in brief electrical comparator. **5**

UNIT - IV

4. a) Explain with the help of neat sketches the principle, construction & working of Auto-collimator. Give it's applications. **10**

b) i) A rectilinear pen recording of a diamond turned surface a sampling length of 0.8mm is selected & vertical to horizontal magnification ratio was 5000/100. Calculate the Ra value if the areas above & below mean line are as follows : **5**

Above	60	115	96	mm^{2}
Below	92	109	70	mm^{2}

ii) Describe with neat sketch three wire method of measuring the effective diameter of a screw threads. **5**

c) i) Write short note on : Profile Projector. **5**

ii) Define the term constant chord. Calculate the chord length & it's distance below the tooth tip for a module 5mm & 20° pressure angle. **5**

UNIT - V

5. a) Name the commonly used measuring machines, describe any one of them in detail. **10**

b) i) Explain different methods of random sampling. **5**

ii) Write short note on : Six Sigma. **5**

c) In a manufacturing process the number of defectives found in the inspection of 20 lots of 100 samples is given below : **10**

Lot No.	No. of defectives	Lot No.	No. of defectives
1	5	11	7
2	4	12	6
3	3	13	3
4	5	14	5
5	4	15	4
6	6	16	2
7	9	17	8
8	15	18	7
9	11	19	6
10	6	20	4

a) Construct appropriate control chart & state whether the process is in statistical control or not.

b) Determine the new value of mean fraction defective if some points are out of control, compute the corresponding control limits & state whether the process is still in control or not.

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