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Reg. No. : .....

Name : .....

**Sixth Semester B.Tech. Degree Examination, May 2018**  
**(2013 Scheme)**  
**13.601 : METROLOGY AND INSTRUMENTATION (MP)**

Time : 3 Hours

Max. Marks : 100

**PART – A**

(Answer **all** questions; **each** carries **2** marks.)

1. What are the possible causes for erroneous reading in spirit level ?
2. List out the manufacturing steps in Slip gauges.
3. Why hole-basis system of fit is generally employed ?
4. Differentiate unilateral and bilateral tolerance.
5. Two parts with the following dimensions are to be assembled. What should be the tolerance on the assembled length ? Part 1.  $25.32_{-0.01}^{+0.02}$  mm and Part 2.  $18.91_{-0.03}^{+0.03}$  mm.
6. Give the difference between the primary texture and secondary texture.
7. State the uses of comparators.
8. List the various materials used to construct mechanical strain gauges.
9. Briefly state the sources of error in CMM.
10. What is the function of piezoelectric transducer ?

**P.T.O.**



## PART – B

(Answer **any one full** question from **each** Module; **each** carries **20** marks.)

**Module – I**

11. a) Distinguish clearly between the Airy points and the points for minimum deflection of a simply supported uniform beam.
- b) Explain the following terms in connection with spirit levels.
- Method of reading changes in slope of level
  - Sensitivity of level
  - Constant of level
  - Relationship between sensitivity and constant of level
  - Accuracy of level.
12. a) With a neat sketch explain the working principle of precision micro-optic clinometer.
- b) Explain the wringing phenomena of slip gauges in detail.

**Module – II**

13. a) Write a short note on interchangeable manufacture and the selective assembly of machine parts.
- b) Determine the dimensions and tolerances of shaft and hole having size of H7/h8 fit. Also determine the minimum clearance and maximum clearance. Consider that 30 mm lies in the range of 18 and 30 mm with  $IT\ 7 = 16 \times$  (standard tolerance) and  $IT\ 8$  (for shaft) =  $25 \times$  (Standard tolerance).
14. a) What are limit gauges ? Sketch and explain any two types of limit gauges.
- b) Explain in detail about relaxations permitted for using gauges which follows the Taylor's principle.

**Module – III**

15. a) Explain the working principle of pneumatic gauge with neat sketch.
- b) Define the term 'flatness' of a surface and how it is determined with the help of autocollimator. State some of the important uses of this instrument.



16. a) In the measurement of surface roughness, heights of twenty successive peaks and troughs were measured from a datum and were 35, 25, 40, 35, 18, 42, 25, 35, 22, 36, 18, 42, 22, 32, 21, 37, 18, 35, 20 microns. If these measurements were obtained over a length of 20 mm, determine CLA (Ra) and RMS value of the rough surface.
- b) Explain in detail about the flatness testing with the principle of interferometry.

**Module – IV**

17. a) For a conductor of uniform cross sectional area 'A' and length 'L', made of material with resistivity 'ρ'. Prove gauge factor =  $1 + 2\nu + [(d\rho/\rho)/dL/L]$  where 'ν' is poisson's ratio.
- b) Discuss in detail about the least square principle applications.
18. a) A 100 mm diameter cylinder was placed between the micrometer anvils. Due to inaccurate placement, the angle between the micrometer and cylinder axis was found to be 1 minute. By using suitable approximations, calculate the amount of error in the measured diameter if the micrometer anvil diameter is 6 mm.
- b) Discuss in detail about the Gaussian error distribution. Which type of error poses this type of error distribution ?
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