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ME 131602

Roll No. of candidate

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2016

**B. Tech 6th Semester End-Term Examination**

**METROLOGY AND INSTRUMENTATION**

Full Marks-100 Pass Marks-35 Time-Three hours

The figures in the margin indicate full marks  
for the questions.

1. Define the following terms : 6×2=12
  - (a) Basic hole and basic shaft
  - (b) Surface roughness
  - (c) Limits of sizes
  - (d) Surface waviness
  - (e) Dynamic error
  - (f) Fundamental deviation.
  
2. Answer the following : (any six) 6×3=18
  - (a) What are the factors affecting surface roughness ?

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- (b) Why is it necessary to give tolerance on engineering dimension ?
- (c) What do you mean by wringing of slip gauge ?
- (d) Distinguish between "Tolerance" and "Allowance".
- (e) What are "least count" and "vernier constant" in case of a vernier caliper ?
- (f) Distinguish between the terms "accuracy" and "precision".
- (g) Distinguish between "gauge" and "comparator".

3. Answer any five :

5×4=20

- (a) Draw the conventional diagram of limits and fits representing the following terms :
  - (i) Basic size
  - (ii) Upper deviation
  - (iii) Lower deviation
  - (iv) Zero line
  - (v) Tolerance

- (b) How are Fits classified ? Give the distinction among clearance Fit, Transition Fit and Interference Fit.

- (c) What is parallelism ? Explain the method of parallelism of two planes for checking straightness.

- (d) In the measurement of surface roughness, heights of successive 10 peaks and troughs were measured from a datum and were 33, 25, 30, 19, 20, 18, 22, 27, 24 and 29 microns. If the measurements were obtained on 10 mm length, determine the CLA and RMS values of surface roughness.

- (e) Find the values of allowances and tolerances for hole and shaft assembly for the following dimensions of mating parts :

Hole :  $25 \begin{matrix} +0.05 \\ +0.00 \end{matrix}$

Shaft :  $25 \begin{matrix} -0.02 \\ -0.05 \end{matrix}$

- (f) State the "Taylor's principle of gauge design.
- (g) What do you mean by concentricity and cylindricity ?

4. Write short notes on any four :  $4 \times 5 = 20$

- (a) Interchangeability
- (b) Profile projector
- (c) Sine bar
- (d) Selective assembly
- (e) Interferrometer
- (f) Snap gauge.

5. Answer the following : (any three)

(a) Design the general type GO and No-GO gauge for components having  $20H_7/f_8$  fit.

Given :

- (i)  $i$  (micron) =  $0.45 \sqrt[3]{D} + 0.001D$
- (ii) Upper deviation of f shaft =  $-5.5 (D)^{0.41}$
- (iii) 20 mm falls in the diameters step of 18 mm to 30 mm
- (iv) IT7 = 16i
- (v) IT8 = 25i
- (vi) Wear allowance 10% of gauge tolerance.

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(b) Describe the construction and working of the Taylor Hobson surface roughness instrument with a neat sketch.  $5+5=10$

(c) Explain principle, construction and working of thermocouple temperature measurement.  $2+3+5=10$

(d) Why are comparators needed ? Describe in brief the construction and working of a mechanical comparator with a neat sketch.  $3+7=10$

(e) What is pyrometry ? What are the types of pyrometer and explain any one in detail.  $2+3+5=10$