

TE / V / PROD) Metrology & Instrumentation / 01.12.15  
 QP Code : 5644

(3 Hours)



[Total Marks : 80

N.B. : 1) Question No. 1 is compulsory.

2) Attempt any THREE questions out of remaining FIVE questions.

3) Assume suitable data wherever necessary.

Q.No.	Marks.
1) a) Answer any SEVEN of the following questions in a few sentences:	( 7*7 = 14)
i) Distinguish between Precision and Accuracy with an example.	
ii) List the advantages of monochromatic source of light in metrology.	
iii) Pick holes from the following list and arrange them in decreasing order of tolerance. Indicate the holes with negative fundamental deviation: C8, N6, e8, D20, g12, m9, N16, A19.	
iv) What is the difference between unilateral and bilateral tolerances? Give an example for each type.	
v) Distinguish between roughness and waviness?	
vi) Distinguish between a comparator and a measuring instrument? State the fields of applications of comparator.	
vii) What do you understand by drunken thread? How it is caused?	
viii) obtain an expression for involute function of a straight tooth spur gear?	
ix) Define: Circular pitch and diametral pitch of a straight tooth spur gear?	
b) Distinguish between Line standard and End standard . Write a short note on construction and wringing of slip gauges?	(6)
2) a) Explain the following:	
i) Selective assembly	
ii) Interchangeability.	(6)
b) Design the general type Go and no Go gauges for the components having 25H <sub>7</sub> /f <sub>8</sub> fit. Being given with usual notations: upper deviation for f shaft: $-5.5D^{0.41}$ ; 25mm falls in the diameter step of 18 to 30mm. Take wear allowance as 10% of gauge tolerance. Also determine: The type of fit and allowance for the fit.	(14)
3) a) With a neat sketch explain the working principle of Parkson's gear tester?	(7)
b) Calculate the gear tooth vernier caliper settings to measure the chordal thickness of a gear of 45 teeth having a module of 4?	(6)
c) Obtain expressions for 'h' and 'w' of a straight tooth spur gear in case of Pitch Line method?	(7)

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- 4) a) In the measurement of surface roughness the heights of 10 successive peaks and valleys over a datum line for a specified sampling length were found as follows: 45, 25, 40, 30, 35, 18, 42, 25, 35, 24  $\mu\text{m}$ . What is the  $R_z$  roughness value of the surface? (6)
- b) Explain with a neat sketch the operation of Taylor Hobson talysurf? (9)
- c) Explain the following briefly:
- i) sampling length; ii) lay; iii)  $R_a$  (5)
- 5) a) What do you understand by Best Wire size. Obtain an expression for the same. Explain with a neat sketch the procedure for measurement of effective diameter of a screw thread by two wire method. Derive the relevant expressions? (10)
- b) When measuring the outside diameter of an external screw thread gauge of 3.5 mm pitch, a 30.5 mm diameter cylindrical standard was used. The micrometer reading over the standard and the gauge were 12.2446 and 13.3748 mm respectively. Calculate the thread gauge outside diameter? (6)
- c) Briefly explain the errors associated with a screw thread. (4)
- 6) a) Sketch a line diagram of optical arrangements of a Pitter-NPL gauge interferometer and explain its working principle? (7)
- b) Explain with a block diagram the principle of operation of back pressure pneumatic comparator. Define various sensitivities associated with it and derive an expression for overall magnification of the comparator in terms of average separation? (8)
- c) Write short notes on any ONE:
- i) Strain gauge. ii) Torque measurement (5)