(3 Hours)   **[Total Marks: 80]**

Instructions:
  (1) **Question No.1 is compulsory and Answer 3 Questions remaining 5 Questions.**
  (2) Assume suitable data wherever necessary
  (3) Concepts explanation with suitable case study justification
  (4) Diagram and sketches explanations are right to reserve full marks

Q1   Answer **Any Four** Questions

  a) Write a short note on Nano Metrology.   **20**
  b) Explain Eddy current testing methods.
  c) Write a note on CMM and enlist its types.
  d) Explain Surface irregularities with sketches measuring parameters R_a, R_z, R_y and RMS.
  e) What is Metrology? Explain different types of standards.

Q2   a) Derive an expression for determination of effective diameter of threads by using   **10**
           two wire method.

         b) Define Interferometry. Explain Laser Interferometer with neat sketch.   **10**

Q3   a) Explain the floating carriage micrometer with principle, construction, and   **10**
           measurement of threads.

         b) Explain Significance of Quality & Quality Control in Industries with suitable   **10**
           examples.

Q4   a) Explain the pneumatic comparator with principle, construction, and operation in   **10**
           detail.

         b) Explain various SQC Tools in quality engineering in detail.   **10**

Q5   a) Calculate the limits, tolerances, and allowances on a 25 mm shaft and hole pair   **10**
           designated H7/g6 to get a precision fit. The fundamental tolerance is calculated
           by the following equation:
           $$i = 0.453 \sqrt[3]{D} + 0.001D$$
           The following data is given:
           (i) Upper deviation of shaft $= -2.5D^{0.34}$
           (ii) 25 mm falls in the diameter step of 18–30 mm
           (iii) IT7 $= 16i$
           (iv) IT6 $= 10i$
           (v) Wear allowance $= 10\%$ of gauge tolerance.

         b) Explain the Parkinson Gear Tester with sketches in Gear profile checking process.   **10**

Q6   Answer **Any Two** Questions   **20**

         a) Explain Autocollimator with sketches and its working principle in detail.
         b) What is acceptance sampling? Explain OC Curve in detail.
         c) Explain in detail - Design of GO and NO-GO gauges procedure with diagram.

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