Time: 3 Hours   Marks: 80

Note:

1. Question number 1 is **compulsory**.
2. Solve any **Three** questions from remaining **Five** questions.
3. **Assume** suitable data if required.
4. Draw neat sketches wherever necessary.

Q.1. Answer **any Four** of the following questions   20

     A] Explain objectives of quality control.

     B] Differentiate between primary and tertiary standards.

     C] Explain importance of surface conditions.

     D] Explain concept of flatness.

     E] Explain Juran's Trilogy.

Q.2.

     A] Explain construction and working of mechanical comparators. State   10
their advantages and limitations.

     B] What are variable and attribute chart? List the uses of attribute chart   10
for **defect and defective-** for constant and variable.

Q.3.

     A] Explain principle, construction and working of Parkinson's gear   10
tester?

     B] Explain concept of quality of design and quality of conformance?   10

Q.4.

     A] Explain three wire method used in screw thread measurement.   10

     B] Sketch OC curve and explain various elements of it? Also explain   10
double sampling plan.

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Q.5.

A] Design the general type of 'Go' and 'NO GO' gauges for a 40mm   **14**
shaft and hole pair designated as 40 H8/d9, given that

   a) Tolerance unit i (in microns) $= 0.453\sqrt[3]{D} + 0.001D$
   b) 40mm lies in the diameter range of 30-50 mm
   c) IT8   = 25i
   d) IT9   = 40i
   e) Upper deviation of shaft $= -16D^{0.44}$
   f) Wear allowance assumed to be 10% of gauge tolerance.

B] Explain ISO 9001:2000 Quality management system standard.   **06**

Q.6.

A] Explain following parameters with respect to surface roughness   **10**
measurement?

   I.   Waviness

   II. Roughness

   III. R_a value

   IV. R_Z value

B] Control Chart for $\overline{X}$ and R are kept on the weight in kilograms of a   **10**
color pigment for a batch process. After 25 subgroups with
subgroup size of 4

   $\Sigma \overline{X} = 52.08$ kg

   $\Sigma R = 11.82$

Assuming process is in state of control, Compute the $\overline{X}$ and R chart
central line and control limits.

(For subgroup size of 4, A_2=0.729 D_4= 2.282 D_3= 0 d_2= 2.059