# 17530

**16172**

**3 Hours / 100 Marks** Seat No. | | | | | | | | |

*Instructions* – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

**1. Attempt any FIVE of the following:** **20**

a) State the various needs of the inspection.

b) State the advantages of wavelength standards over the material standards.

c) An angle of 33°-9′-15″ is to be measured with the help of the 13 pieces standard set of angle gauges. Show the arrangement of angle gauges with a neat sketch by selecting minimum number of gauges.

d) Explain various errors in gears.

**Marks**

e) Explain:

(i) Primary texture

(ii) Secondary texture

(iii) Sampling length

(iv) RMS value in surface finish

f) State the various objectives of the quality control (any eight)

g) Explain the procedure for P-chart.

**2. Attempt any FOUR of the following:** **16**

a) What is legal metrology? State any two functions of legal metrology.

b) State the need and uses of the comparators.

c) Explain the Taylors principle of gauge design.

d) Explain the working principle of clinometer with neat sketch.

e) Explain the two wire method of effective diameter measurement with neat sketch.

f) Explain the method of gear tooth thickness measurement by Gear tooth vernier with neat sketch.

**3. Attempt any FOUR of the following:** **16**

a) Explain the (LVDT) Electrical comparator with neat sketch.

b) Design the 'Workshop' and 'General Purpose' types of GO and NO-GO plug gauges for checking the hole of $30^{+0.05}_{-0.03}$ mm. Assume each of the wear allowance and gauge allowance as 10% of work tolerance.

c) Explain the working principle of angle dekkor with neat sketch.

d) Explain the measurement of the pitch for internal and external thread with neat sketch.

e) Explain Taylor-Hobson-Talysurf with neat sketch.

f) Explain how the parallelism between two planes and parallelism between two axes is checked with neat sketch.

**Marks**

**4. Attempt any FOUR of the following:** **16**

a) State the characteristics of the end standards.

b) Explain the multi-gauging machine with neat sketch. State it's any two advantages.

c) State and explain the various pitch errors in the screw threads.

d) Explain the working of Parkinson Gear Tester with neat sketch.

e) State methods of evaluation of surface roughness. Explain any one in detail.

f) Explain the various types of quality audit.

**5. Attempt any FOUR of the following:** **16**

a) State the essential characteristics of the good comparator (any eight)

b) State the various factors controlling the quality of design.

c) Explain the methodology of six sigma.

d) State various types of sampling methods. Explain any one in detail.

e) State the various factors responsible for the variation due to assignable causes.

f) Explain the process capability.

**Marks**

**6. Attempt any TWO of the following:** **16**

a) In a capability study of a lathe use in turning a shaft to a diameter of 23.75 ± 0.1 mm a sample of 6 consecutive pieces was taken each day for 8 days. The diameter of these shafts are given below.

| 1st day | 2nd day | 3rd day | 4th day | 5th day | 6th day | 7th day | 8th day |
|---|---|---|---|---|---|---|---|
| 23.77 | 23.80 | 23.77 | 23.79 | 23.75 | 23.78 | 23.76 | 23.76 |
| 23.80 | 23.78 | 23.78 | 23.76 | 23.78 | 23.76 | 23.78 | 23.79 |
| 23.78 | 23.76 | 23.77 | 23.79 | 23.78 | 23.73 | 23.75 | 23.77 |
| 23.73 | 23.70 | 23.77 | 23.74 | 23.77 | 23.76 | 23.76 | 23.72 |
| 23.76 | 23.81 | 23.80 | 23.82 | 23.76 | 23.74 | 23.81 | 23.78 |
| 23.75 | 23.77 | 23.74 | 23.76 | 23.79 | 23.78 | 23.80 | 23.78 |

Construct the $\bar{X}$ and R chart and find out the process capability for the machine. Take $A_2 = 0.48$, $D_3 = 0$, $D_4 = 2$ and $d_2 = 2.534$.

b) The following table gives the numbers of missing rivets noted at aircraft final inspection:

| Air Plane No. | No. of missing reverts | Air Plane No. | No. of missing reverts | Air Plane No. | No. of missing reverts |
|---|---|---|---|---|---|
| 1 | 8 | 10 | 12 | 19 | 11 |
| 2 | 16 | 11 | 23 | 20 | 9 |
| 3 | 14 | 12 | 16 | 21 | 10 |
| 4 | 19 | 13 | 9 | 22 | 22 |
| 5 | 11 | 14 | 25 | 23 | 7 |
| 6 | 15 | 15 | 15 | 24 | 28 |
| 7 | 8 | 16 | 9 | 25 | 9 |
| 8 | 11 | 17 | 9 | | |
| 9 | 21 | 18 | 14 | | |

Find $\bar{C}$ compute trial control limits and plot control chart for C. What values of C' would you suggest for the subsequent period?

c) Explain Ideal and Actual O.C. curve with all significant points and regions.