

Time: 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.
 - 4) Use of Graph paper is allowed.
 - 5) Figures to the right indicate full marks.

1. Answer the following questions (*any Four*). 20

- i) What is Metrology? Explain different types of standards.
- ii) With respect to surface roughness parameters explain the following terms:
i) Ra; ii) Ry; iii) Rz
- iii) Define:
i) Sensitivity
ii) Precision
iii) Threshold
- iv) Explain the working of LVDT with a neat sketch.
- v) Distinguish between open loop and closed loop control systems.
- vi) Using Routh's criterion examine the stability of a control system whose characteristic equation is $4S^5 + 2S^4 + 4S^3 + 8S^2 + 2S + 10 = 0$

2. (A) Explain with a neat sketch the N.P. L. flatness interferometer. 10

(B) Design a general type of Go and No Go plug gauge for inspecting a hole 25 D8. Given that: 10

$$i = 0.40 \sqrt[3]{D} + 0.001D \text{ micron}$$

$$\text{Tolerance for hole} = 25 i$$

$$\text{Fundamental deviation of the hole} = 16 D^{0.44}$$

Wear allowance 10% of gauge design

3. (A) Explain the term clearance fit with respect to limit fit diagram 05

(B) Derive necessary expression to calculate the best wire diameter. 05

(C) Draw the Root-Locus of the system having 10

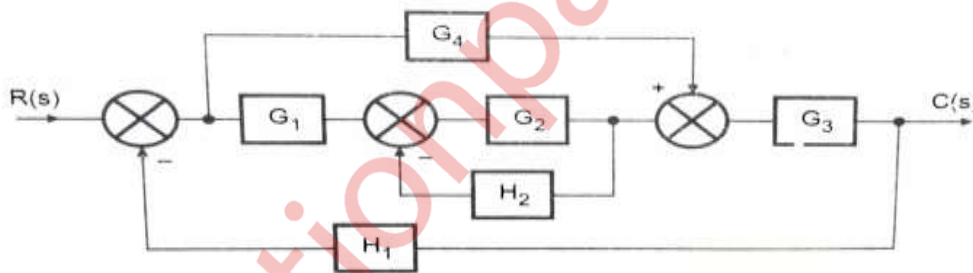
$$G(s)H(s) = \frac{K}{S(S+1)(S+4)}$$

4. (A) Define gauge factor of strain gauges. Derive an expression for gauge factor. 05
 (B) Briefly, discuss drift. 05
 (C) A system has transfer function given by 10

$$G(s)H(s) = \frac{100(s+2)}{s(s+1)(s+4)}$$

Determine:

- i) Type of system
 ii) Error constants K_p , K_v and K_a
 iii) Steady state error for input magnitude 2 10
5. (A) Explain generalized measurement system elements with block diagram. Describe its function with suitable examples. 10
 (B) Reduce the given block diagram to a its canonical form and hence obtain equivalent transfer function, $\frac{C(s)}{R(s)}$. 10



6. Write short note on (any Four) 20
- i) Mc-Leod Gauge
 - ii) RTD
 - iii) Magnetic Flow Meter
 - iv) Frequency Domain Specifications
 - v) Parkinson's Gear Tester
 - vi) Range and Span