

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 the relationship between sensitivity and range? What is the disadvantage of very sensitive instrument?
- ii) Differentiate between Primary, Secondary, Tertiary, Working standards.
- iii) Define interferometry. Explain why monochromatic light is used for interferometry and not the white light.
- iv) Illustrate the working principle of nozzle flapper for displacement measurement.
- v) Explain open loop and closed loop control systems.
- vi) Using Routh's criterion examine the stability of a control system whose characteristic equation is $S^8 + 5S^6 + 2S^4 + 3S^2 + 1 = 0$

2. (A) Explain the 'Three Wire Method' used in screw thread measurement. (10)

(B) Design a general type of Go and No Go gauges for component having 25 H/f₈ fit. (10)

Given that:

$$i = 0.45\sqrt[3]{D} + 0.001D \text{ micron}$$

- a) The upper deviation for f shaft = $-5.5 D^{0.41}$
 - b) 25 mm falls in the diameter step of 18 and 30
 - c) Wear allowance = 10% gauge tolerance
3. (A) Describe with neat diagrams the construction and working principle of *Ionization* (10)
and Thermal Conductivity gauges for pressure measurement.
- (B) Draw the root locus and comment on the stability of the control system having open (10)
 loop transfer function as follows:

$$G(s)H(s) = \frac{K}{s(s+1)(s+2)(s+3)}$$

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4. (A) What are desired, modifying and interfering inputs? Explain with example. Also (10)
suggest the methods to minimize the effect of modifying and interfering inputs.

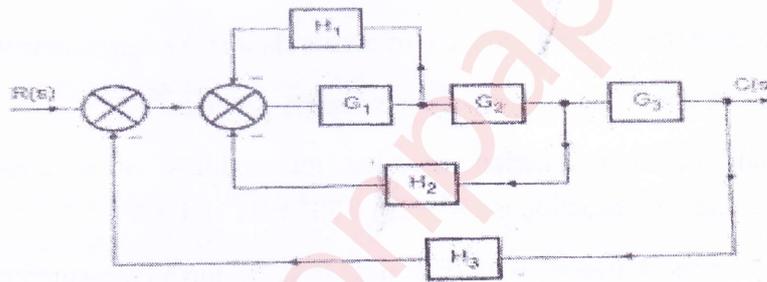
(B) A second order system is given by $\frac{C(s)}{R(s)} = \frac{25}{s^2 + 6s + 25}$ (10)

Find its rise time, peak time, peak overshoot and settling time to unit step input. Also find expression for its output response.

5. (A) With neat sketch, explain the constructional features and working of (10)

- i) LVDT
- i) Parkinson's Gear Tester

(B) Reduce the given block diagram to its canonical form and hence obtain equivalent (10)
transfer function, $\frac{C(s)}{R(s)}$.



6. Write short note on (any Four) (20)

- i) Ultrasonic flow meter
- ii) Interference fit
- iii) Talinon surface tester
- iv) Frequency domain specifications
- v) Repeatability and Reproducibility
- vi) Strain gauge based load cells