

Time: 3 Hours

Total Marks: 80

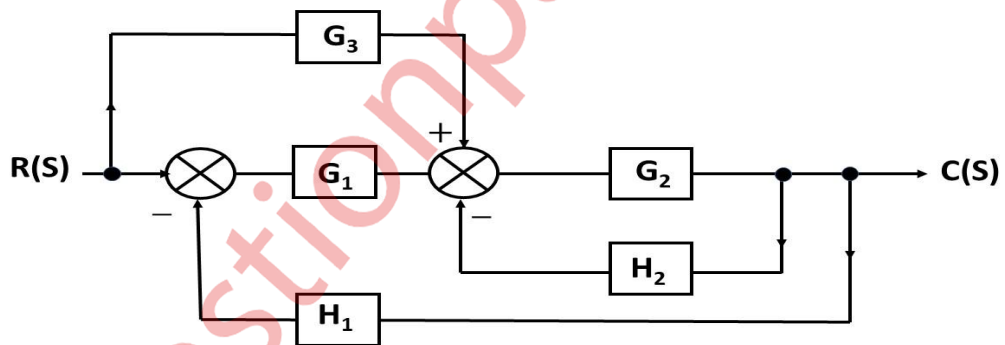
- N.B:** 1) Question No. 1 is compulsory.  
 2) Attempt any **THREE** questions out of remaining **FIVE** questions.  
 3) Assume suitable data wherever necessary.  
 4) Use of Graph paper is allowed.  
 5) Figures to the right indicate full marks.

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

- i) Define wavelength standard and state the significance of using it.
- ii) Explain different types of fits with suitable examples and sketches
- iii) Differentiate between roughness and waviness.
- iv) Define and explain i) Resolution; ii) Threshold; iii) Hysteresis
- v) Briefly explain the construction and working of a strain gauge load cell.
- vi) Using Routh's criterion examine the stability of a control system whose characteristic equation is  $S^5 + S^4 + 2S^3 + 2S^2 + 3S + 15 = 0$

2. (A) Define Interferometry. Explain Laser Interferometer with neat sketch. 10

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



3. (A) Explain generalized measurement system elements with block diagram. Describe functions with suitable examples. 10

(B) A unity feedback system has  $G(s) = \frac{K}{s(2+s)(4+s)}$  10

- a. If  $r(t) = 2t$  and  $K = 4$ , find steady state error.
- b. If it is desired to have steady state error to be 0.4, find corresponding value of "K"
- c. Find steady state error if input is changed to  $2+6t$ , and value of K to 10.

4. (A) Explain principle, construction and working of *Parkinson Gear Tester* 10  
 (B) Draw the root locus and comment on the stability of the control system having open loop transfer function as follows: 10

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

5. (A) What are encoders? With a neat sketch, explain the working of an incremental and absolute optical encoder. Give examples of their use. 10  
 (B) Design a general type of Go and No Go plug gauge for inspecting a hole 25 d8. Given that: 10

$$i = 0.40 D^{1/3} + 0.001D \text{ micron}$$

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

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

Wear allowance 10% of gauge design

6. Write short note on (*any Four*) 20
- i) Floating Carriage Micrometer
  - ii) Repeatability and Reproducibility
  - iii) Ultrasonic Flow Meter
  - iv) Capacitive Pressure Transducer
  - v) Types of Measurement System Inputs
  - vi) Frequency Domain specifications

\*\*\*\*\*