03-06-2026 TE MECHANICAL SEM-V C SCHEME MMC QP CODE:10094437

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 difference between unilateral and bilateral tolerances? Why is unilateral tolerance preferred over bilateral tolerance?

ii) Define surface roughness. Why surface finish is important in engineering applications?

iii) Discuss the characteristics of line standards and end standards.

iv) Derive an expression for the best size wire.

v) Explain open loop and closed loop control systems.

vi) A system is represented by the characteristic equation

$$P(S) = S^6 + S^5 + 8S^4 + 12S^3 + 20S^2 + 16S + 16 = 0,$$

Determine the stability of the system by using Routh's criterion

2. (A) What are the different elastic transducers used for pressure measurement? Illustrate the working principle of any one of them. **(10)**

(B) Explain Taylor's principle of ***GO and NO- GO*** gauge design. **(10)**

Determine the dimensions and tolerances of shaft and hole having size of $\mathbf{30H_7/\ h_8}$ fit. Also determine allowance (i.e. minimum clearance) and maximum clearance.

Given that:

a) $\mathbf{i = 0.45\sqrt[3]{D} + 0.001D}$ micron
b) 30 mm lies in the range of 18 and 30 mm
c) $IT7 = 16i$

3. (A) With neat sketch, explain the working of an optical pyrometer. **(05)**

(B) Define gauge factor of strain gauges. Derive an expression for gauge factor. **(05)**

(C) A system is characterized by transfer function **(10)**

$$G_{(S)}\ H_{(S)} = \frac{K}{S\,(S+2)\,(S+4)}$$

Determine the stability of the system by using root locus method.

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

(B) A unity feedback system has **(10)**

$$G(s) = \frac{10(S+1)}{S^2(S+2)(S+10)}$$

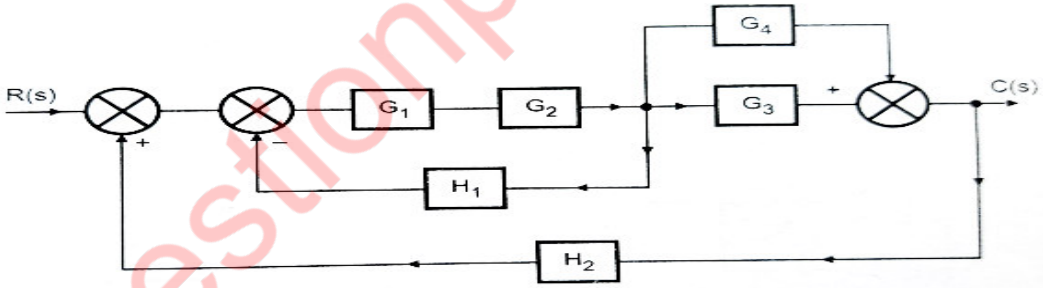
Determine:

a. Type of system
b. Error coefficients
c. Steady state error for input as $1 + 4t + \frac{t^2}{2}$

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

i) Parkinson's Gear Tester
ii) Ultrasonic Flow Meter

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



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

i) Tomlinson Surface Tester
ii) Laser Interferometer
iii) Floating Carriage Micrometer
iv) Reproducibility and Repeatability
v) Resistance Temperature Detector (RTD)
vi) Frequency Domain Specifications

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