K. K. Wagh Institute of Engineering Education & Research, Nashik

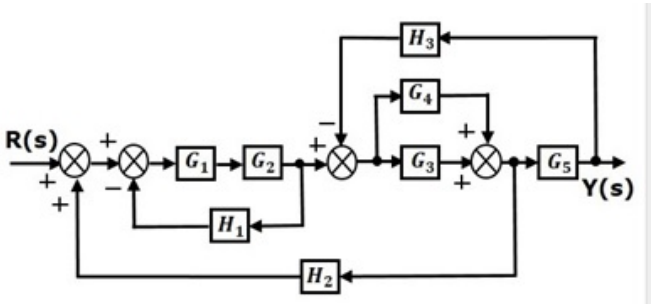
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:V
Class:TY	Program:B.Tech
Branch Code:MEC	Pattern:2022
Name of Course:Mechatronics	Course Code:MEC223009
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

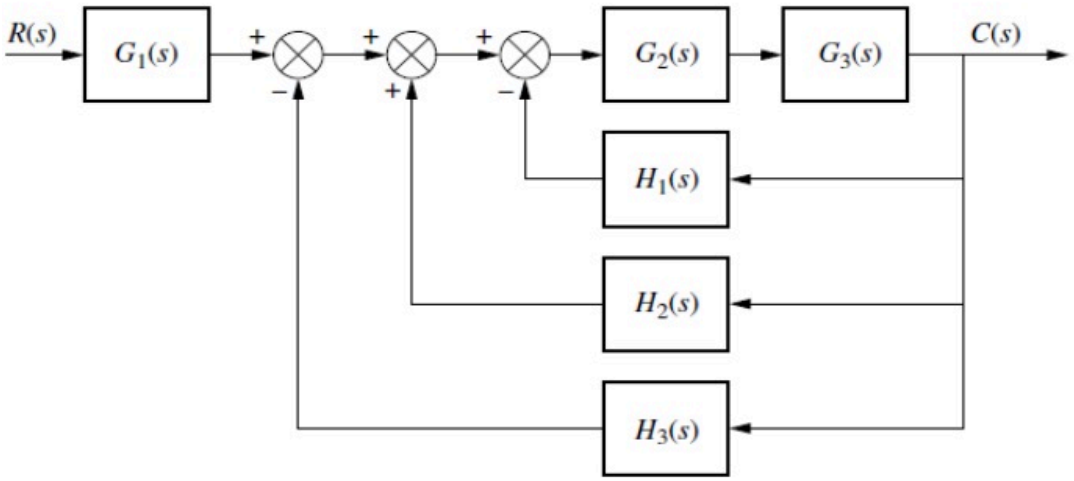
1. This question paper contains 02page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome of the Question/sub-question.

		Marks	**CO**
Question No. 1			
1a)	**Explain** elements of Measurement system with suitable block diagram.	(6)	CO1
Question No. 2			
2a)	**Explain** Elements of Multiple channel Data acquisition system (DAS) with suitable block diagram.	(6)	CO1
Question No. 3			
3a)	For the given block diagram of mechatronics system **determine** overall transfer function.	(8)	CO2



OR

3b)	For the given block diagram of mechatronics system **determine** overall transfer function.	(8)	CO2



3c) **Build** mathematical model for Translational mechanical system using basic building blocks and determine transfer function of the system. (8) CO2

OR

3d) **Build** mathematical model for Thermal system using basic building blocks. (8) CO2

Question No. 4

4a) **Outline** the sketch to depict unit step response of 2nd Order system. for various damping ratio **ζ =0, 1, >1, <1 .** (8) CO3

OR

4b) **Differentiate** between relative and absolute stability criteria also Determine the type of damping for the given system. (8) CO3

$$\frac{C(s)}{R(s)} = \frac{2}{s^2 + 2s + 1}$$

4c) **Analyze** the given transfer function of the system for relative stability criteria by pole zero plot. (8) CO3

$$\text{T.F.} = \frac{K(s+6)}{s(s+2)(s+5)(s^2+7s+12)}$$

OR

4d) **Analyze** the given transfer function of the system for absolute stability by Routh's criteria. (8) CO3

$$2s^3 + 4s^2 + 4s + 12 = 0$$

Question No. 5

5a) **Summarize** the different types of timers and counters used in PLC programming. (8) CO4

OR

5b) **Deduce** ladder program for following logic gates with truth table AND, OR, EX-OR, EX-NOR. (8) CO4

5c) **Justify** with neat sketch the use of a PID controller with a suitable example. (8) CO4

OR

5d) **Compare** Integral and Derivative controller with reference to 1. Transfer function 2. Characteristic plot 3. Advantage 4. Limitation . (8) CO4

····· End of question paper·····