Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Fifth Semester

MECHATRONICS ENGINEERING

U18MCT5004: Control Engineering

COURSE OUTCOMES

CO1: Know the significance to control engineering and the basic construction of control systems.
CO2: Develop mathematical equations for model mechanical, electrical systems and can able to compute transfer function using block diagram and signal flow graph methods
CO3: Analyze the 1st and 2nd order systems in time domain for various test signals and Calculate steady state errors and derive generalized error series in the time domain analysis
CO4: Analyze the 1st and 2nd order systems in frequency domain using Bode and Polar plots
CO5: Calculate the stability of the system using Routh Hurwitz, Nyquist and Root Locus techniques
CO6: Explain about PID control and tuning, time delay responses and also discuss sequence control in process industry

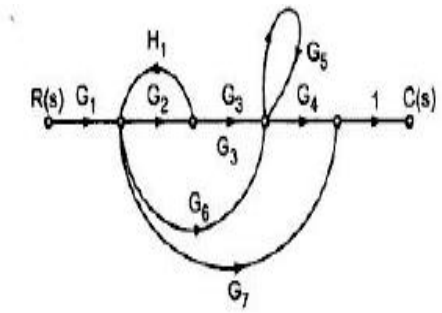
Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1. Differentiate continuous time and discrete time control systems CO1 [K_2]
2. Identify individual loop gain in the signal flow graph CO2 [K_3]

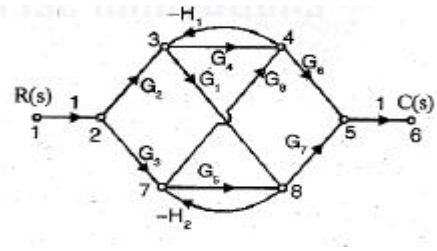


3. List the types of the test signal and draw the waveform CO3 [K_2]
4. Define damping ratio CO4 [K_2]
5. List the factors that frequently occur in typical transfer function in Bode plot CO4 [K_2]
6. Using Routh Stability Criterion, Find the stability for the given transfer function , CO5 [K_3]

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

7.		Find the asymptotes for the given transfer function $G(S)H(S) = \frac{K}{S(S+2)(S+5)}$		CO5	[K3]
9.		Write the transfer function of P,PI,PD controllers		CO6	[K2]
10.		Why derivative controller is not used in control system?		CO6	[K2]

Answer any FIVE Questions:-PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	Explain the temperature control system in both open loop and closed loop control system with neat block diagram.	12	CO1	[K2]
	b)	Differentiate open loop system and closed loop system.	4	CO1	[K2]
12.		Find the overall transfer function of the system whose signal flow graph is shown in Fig 	16	CO2	[K3]
13.		For a unity feedback control system the open loop transfer function , $G(S) = \frac{10(S+2)}{S^2(S+1)}$. Find a) the position, velocity and acceleration constants. b) To find static error when the input is $R(S) = \frac{3}{S} - \frac{2}{S^2} + \frac{1}{3S^2}$	16	CO3	[K3]
14.		Sketch the bode plot in the following transfer function and determine the system gain K for the gain cross over frequency to be 5 rad/sec. $G(S) = \frac{KS^2}{(1+0.2S)(1+0.02S)}$	16	CO4	[K3]
15.	a)	Construct Routh array and determine the stability of the system represented by the characteristic equation $S^5+S^4+2S^3+2S^2+3S+5=0$	8	CO5	[K3]
	b)	By Routh stability criterion determine the stability of the system represented by the characteristic equation, $9S^5-20S^4+10S^3-S2-9S-10$	8	CO5	[K3]
16.		Discuss in detail about P,PI ,PD and PID Controller with neat sketch.	16	CO6	[K2]

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