KUMARAGURU
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B.E. DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Fourth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U18EII4203: Modelling and Analysis of Dynamic Systems

COURSE OUTCOMES

CO1: Model any given 1st and 2nd order physical system and analyse the dynamic response.

CO2: Apply the block diagram reduction technique, Signal flow Graph, Bond graph and State space Modelling for the given physical system.

CO3: Analyse the time response for the given system and the steady state error.

CO4: Analyse the stability of the given system using Bode plot, polar plot and Nyquist plot and also analyse the stability in digital domain.

CO5: Examine the given physical model using simulation tools.

CO6: : Inference the model in Time and Frequency domain and experiment validation for the same.

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

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
**(Answer not more than 40 words)**

1.	Define transfer function.	CO1	[K1]
2.	Write force balance equation of ideal spring, ideal mass and ideal dashpot	CO1	[K1]
3.	What are the properties of signal flow graphs?	CO2	[K1]
4.	What is block diagram?	CO2	[K1]
5.	How will you find root locus on real axis?	CO2	[K2]
6.	Write the necessary and sufficient condition for the stability in Routh Stability criterion	CO4	[K2]
7.	Define Steady state error.	CO3	[K1]
8.	What are transient and steady state response of a control system?	CO3	[K1]
9.	.How the roots of characteristic equation are related to stability?	CO4	[K2]
10.	The addition of a pole will make a system more stable. Justify your answer.	CO4	[K3]

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

11. Determine the transfer function $X_1(s)/F(s)$ and $X_2(s)/F(s)$ for the system shown below 16 CO1 [K$_L$]
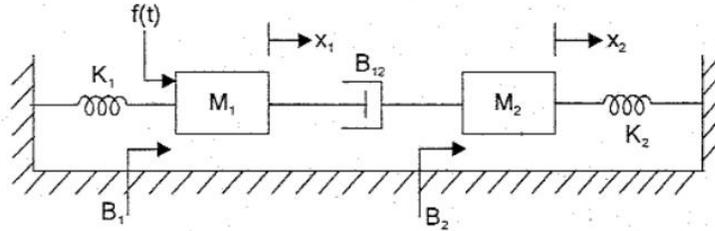
12. Find the overall gain for the signal flow graph shown below 16 CO2 [K$_L$]
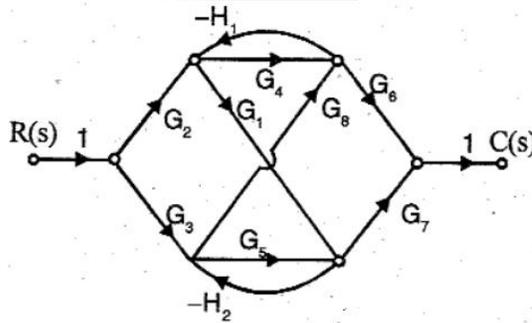
13. Sketch the Root locus of the systems whose open loop transfer function is 16 CO2 [K$_L$]

$$G(s) = \frac{K}{s(s+2)(s+4)},$$

Find the value of K so thath the damping ratio of the closed loop system is 0.5

14. a) A unity feedback system has the following forward transfer function 8 CO3 [K$_L$]

$$G(s) = \frac{K_1(2s+1)}{s(5s+1)(1+s)^2}$$

Determine the minimum value of K, so than the steady state error is less than 0.1 for the input $r(t)=1+6t$

b) Using Routh criterion, determine the stability of the system represented by the following characteristic equation 8 CO3 [K$_L$]

$$s^6+2s^5+8s^4+12s^3+20s^2+16s+16=0$$

15.   Sketch the bode plot for the following transfer function and Determine the phase   16   CO4   [K3]
margin and Gain margin

$$G(s) = \frac{75\,(1+0.2s)}{s\,(s^2 + 16s + 100)}$$

16.   Sketch the polar plot and determine the gain margin and phase margin for the   16   CO4   [K3]
open loop transfer function of a unity feedback system is given by

$$G(s) = 1/\ (S^2(1+S)(1+2S))$$

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