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Question Paper Code: U4302

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2023

Fourth Semester

Electrical and Electronics Engineering

21UEE402 – CONTROL SYSTEMS

(Regulations 2021)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

|		
1.	What are the properties of signal flow graphs?	CO1- U
2.	Explain the drawbacks of static error co-efficient.	CO1- U
3.	How the transient responses of a system with feedback differ from that without feedback?	CO1- U
4.	Classify the control system is depending on the value of damping ratio.	CO1- U
5.	Explain the initial slope of the Bode magnitude plot for a system having no poles at the origin?	CO1- U
6	Define gain cross over frequency	CO1- U
7	Draw the circuit of lead compensator and draw its pole – zero plot.	CO1- U
8	Show the transfer function of Nyquist stability criterion?	CO1- U
9	Define Controllability.	CO1 -U
10	Explain the properties of state transition matrix?	CO1- U

PART – B (5 x 16= 80Marks)

11. (a) Develop the closed loop transfer function $C(s)/R(s)$ of the system whose block diagram is shown in figure.   CO1 -App   (16)
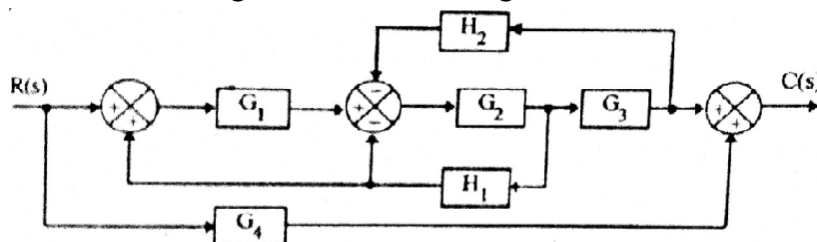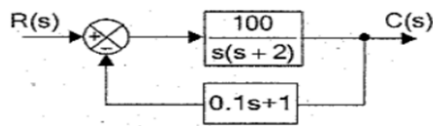
Or

(b) Identify the overall gain C(s)/R(s) for the signal flow graph shown in fig   CO1- App   (16)
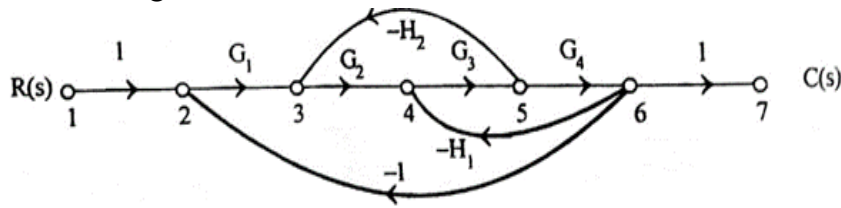
12. (a) Analyze the response of the system for unit step input to position control system with velocity feedback   CO2 -App   (16)

Or

(b) Derive the unit step response of the critically damped for second order system   CO2 -Ana   (16)

13. (a) Construct the Bode plot for the following transfer function and obtain the gain and phase cross over frequency whose   CO3- Ana   (16)

$$G(s) = \frac{20}{s(1+3s)(1+4s)}$$

Or

(b) Construct the Polar plot for the following transfer function and obtain the gain margin and phase margin whose   CO3 -Ana   (16)

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

14. (a) Construct Routh array and determine the stability of the system represented by the characteristics equation and comment on the location of roots.   CO4 -U   (16)

(i) $S^5 + S^4 + 2S^3 + 2S^2 + 3S + 5 = 0$

(ii) $S^7 + 5S^6 + 9S^5 + 9S^4 + 4S^3 + 20S^2 + 36S + 36 = 0$

Or

(b) A unity feedback control system has an open loop transfer function G(s)=K/(s(s²+4s+13)). Sketch the root locus.   CO4- Ana   (16)

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15. (a) Explain the procedure for design of lead compensator.   CO3 -App   (16)

Or

(b) Consider the system with the state equation. Interpret the   CO3- App   (16)
controllability of the system

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

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