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Reg. No. : | | | | | | | | | | | | |

Question Paper Code: U9401

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

Elective

Electronics and Communication Engineering

21UEC901- LINEAR CONTROL ENGINEERING

(Regulations 2021)

Duration: Three hours | Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. A control system in which the control action is somehow dependent on the output is known as — CO1 -U

   (a) Closed loop system (b) Open loop system

   (c) Semi closed loop system (d) None the above

2. The position and velocity error of a Type-2 systems are — CO1 -U

   a) Constant, constant (b) Constant, infinity

   (c) Zero, constant (d) Zero, zero.

3. If the system is represented by G(s) H(s) =k(s+7)/s(s+3)(s+2), what would be its magnitude at w=∞ — CO1 -U

   (a) 0 (b) ∞ (c) 7/10 (d) 21

4. The type 2 system has -------- at the origin. — CO1 -U

   (a) no net pole (b) net pole (c) Simple pole (d) two poles

5. State model representation is possible using _____ — CO1 -U

   (a) Physical variables (b) Phase variables

   (c) canonical state variables (d) all the above

PART – B (5 x 3= 15 Marks)

6. Compare translational and rotational system. — CO1 -U

7. What is the effect of PID controller on the system performance? — CO1 -U

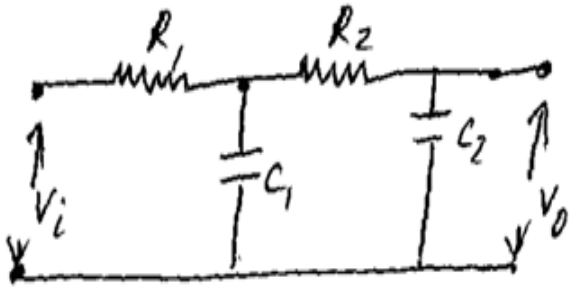
8. Summarize the advantages of Frequency Response Analysis. — CO1- U

9. What is the advantage of using root locus for design? CO1- U

10. What is Nyquist stability criterion? CO1- U

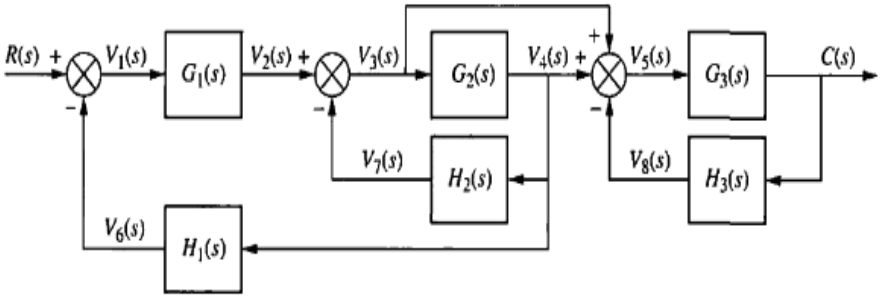
PART – C (5 x 16= 80 Marks)

11. (a) Estimate the Transfer function of the electrical network shown in the figure. CO2 -App (16)



Or

(b) For the block diagram shown below, inspect the output C/R. CO2- App (16)



12. (a) A unity feedback system with unit step input for which open loop transfer G(s) = 20/s(s+10). Solve for the transfer function, the natural Frequency, the damping ratio and the Damped frequency of oscillation and Calculate the delay time, rise time and peak overshoot. CO2 -App (16)

Or

(b) For unity feedback control system a open loop transfer function $G(s) = \frac{10(s+2)}{s^2(s+1)}$. CO2 -App (16)

Find (i) position, velocity and acceleration error constants,

(ii) Steady state error when the input is $R(s) = \frac{3}{s} - \frac{2}{s^2} + \frac{1}{3s^3}$

13. (a) Report the value of gain and phase cross over frequencies for the following $G(S) = \frac{10}{S(1+0.4S)(1+0.1S)}$ function using bode plot.. CO3- App (16)

Or

(b) The open loop transfer function of a unity feedback system is given by CO3 -App (16)

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

Sketch the polar plot and determine the gain margin and phase margin.

14. (a) Using Routh-Hurwitz criterion determine the stability of a system representing the characteristic equation $s^5+s^4+2s^3+2s^2+3s+5=0$ and comment on location of the roots of the characteristic equation. CO3 -Ana (16)

Or

(b) Plot the root locus of the transfer function $\frac{K}{S(S+2)(S+4)}$ whose H(s) = 1. Determine open loop gain k CO4- Ana (16)

15. (a) Develop the Transfer function of the matrix from the data given below. $\frac{Y(s)}{U(s)} = \frac{s+2}{s^3+9s+26s+24}$ and analyze the controllability and Observability of the system. CO3- Ana (16)

Or

(b) Develop the Transfer function of the matrix from the data given below. $A = \begin{bmatrix} -3 & 1 \\ 0 & -1 \end{bmatrix}; B = \begin{bmatrix} 1 \\ 1 \end{bmatrix}; C = \begin{bmatrix} 1 & 2 \end{bmatrix}$ and D=0. Also analyze the stability condition of the system. CO3- Ana (16)