C **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 99404

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

Elective

Electronics and Communication Engineering

19UEC904- Control Engineering

(Regulation 2019)

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 type 0 system has _____ at the origin CO1- U

   (a) no pole (b) net pole (c) simple pole (d) none of the above

3. By equating the denominator of transfer function to zero, which among the following will be obtained? CO1- U

   (a) Poles (b) Zeros (c) Both a and (d) None of the above

4. Technique gives quick transient and stability response CO1- U

   (a) Root locus (b) Bode (c) Nyquist (d) Nichols

5. State space analysis is applicable even if the initial conditions are _____ CO5- U

   (a) Zero (b) Non-zero (c)) Equal (d) Not equal

PART – B (5 x 3= 15 Marks)

6. State Mason's gain formula. CO1 U

7. Determine the Damping ratio and natural frequency of oscillation for the closed loop transfer function of a second order system is given by CO2 App

$$G(s) = \frac{400}{s^2 + 2s + 400}$$

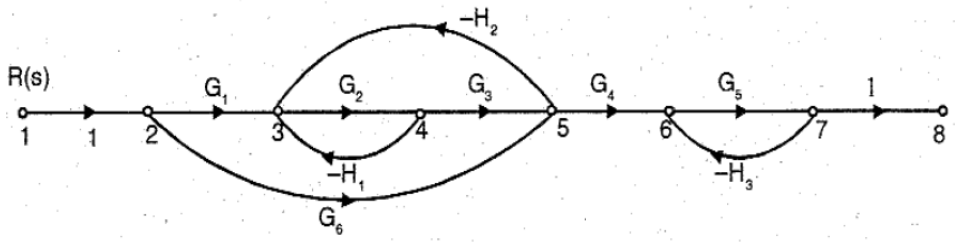
8. What are the advantages of Bode plot? CO1 U

9. What is the necessity of compensators? CO1 U

10. Explain the concept of Controllability. CO3 U

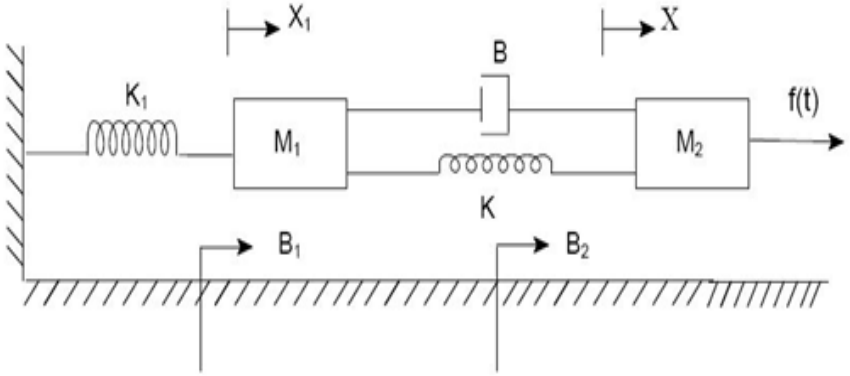
PART – C (5 x 16= 80 Marks)

11. (a) Using signal flow graph, analyze the overall Transfer function for the system shown in the fig. CO2-App (16)



Or

(b) Demonstrate the differential Equations governing the mechanical system shown in the fig. and determine the transfer function. CO2-App (16)



12. (a) The open loop transfer function of a unity feedback system is given byG(s)=K/s(Ts+ 1) where K and T are positive constants. By what factor should the amplifier gain be reduced so that the peak overshoot of unit step response of the system is reduced from 75% to 25. CO3- Ana (16)

Or

(b) A unity feedback control system has an open loop transfer function *G(S) = 10/s(s+2)*. Find the rise time, percentage over shoot, peak time and settling time. CO3- Ana (16)

13. (a) The open loop transfer function of a unity feedback system is given by CO3- Ana (16)

$$G(s) = \frac{K}{s(1+0.2s)(1+0.05s)}$$

Sketch the polar plot and determine the value of K such that

(i) gain margin is 18db (ii) phase margin is 60o

Or

(b) Consider a unity feedback system having an open loop transfer function $G(s) = \frac{K}{s(s+0.5s)(1+4s)}$ CO3- Ana (16)

Outline the polar plot and determine the value of K so that

(i) Gain margin is 20db

(ii) Phase margin is 30°.

14. (a) The open loop transfer function of a unity feedback system given by CO3- Ana (16)

$G(s) = \frac{K(s+9)}{s(s^2+4s+11)}$. Sketch the root locus of the system and the evaluate the system stability with respect to their location of poles.

Or

(b) Using Routh Hurwitz criterion determine the stability of a system representing the characteristic equation **$s^6+2s^5+8s^4+12s^3+20s^2+16s+16=0$** and comment on location of the roots of the characteristic equation. CO3- Ana (16)

15. (a) The State model matrices of a system are given below CO3- Ana (16)

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix}; B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \text{ and } C = [\,3 \quad 4 \quad 1\,] \text{ .}$$

Generalize the Observability of the system using Gilberts test and thereby analyze the stability of the system.

Or

(b) Determine the state variable representation of the system whose transfer function is given as $\frac{Y(s)}{U(s)} = \frac{2s^2 + 8s + 7}{(s+2)^2(s+1)}$ CO3- Ana (16)