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

Question Paper Code: 99404

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2022

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 damping ratio and peak overshoot are measures of: CO1- U

   (a) Relative stability (b) Speed of response (c) Steady state error (d) Absolute stability

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. For the polynomial $R(s)= s^5+s^4+2s^3+2s^2+3s+15=0$ the number of roots which lie in the right half of S plane is CO2- App

   (a) 4 (b) 3 (c) 2 (d)1

5. Which among the following plays a crucial role in determining the state of dynamic system? CO5- U

   (a) State variables (b) State vector (c) State space (d) State scalar

PART – B (5 x 3= 15 Marks)

6. Compare the Open loop System with Closed loop System. CO1-U

7. The damping ratio and natural frequency of a second order system are 0.5 and 8 rad/sec respectively. Calculate resonant peak and resonant frequency. CO2- App

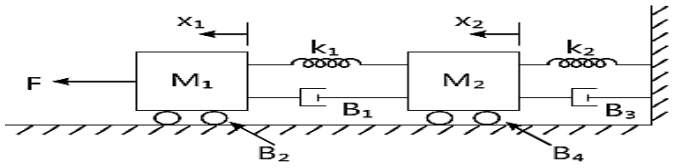
8. Define Phase margin & gain margin. CO1-U

9. Brief the computation process of angle of departure. CO2-U

10 Explain the concept of Controllability. CO3-U

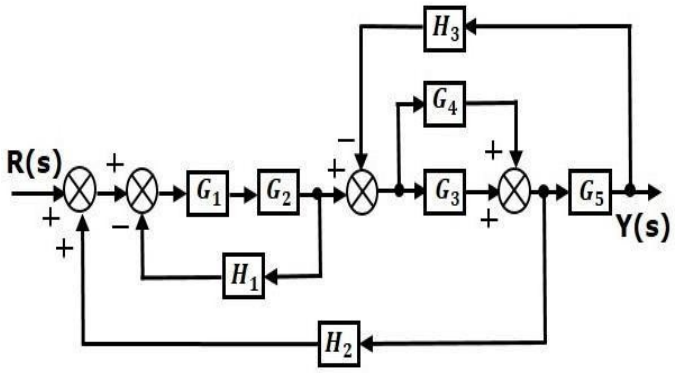
PART – C (5 x 16= 80 Marks)

11 (a) Write the differential equation of the system and draw the force voltage analogous circuits. Also derive the mathematical model of the mechanical system. CO2-App (16)



Or

(b) Using block diagram reduction technique, Find the closed loop transfer function for the given system. CO2-App (16)



12 (a) Derive the response of under damped and critically damped second order system for unit step input**.** CO2-App (16)

Or

(b) An unit feedback system has G(s) =1/s(1+2s). The input to the system is described byr(t)=2+4t+6t2+2t3. Determine the generalized error coefficients and express the steady state erroras a function of time. CO2- App (16)

13 (a) Discuss briefly about the lag, lead and lag-lead compensators with examples. CO5- U (16)

Or

(b) Write down the procedure for designing lead compensators using Bode plot. CO5- U (16)

14 (a) Label the Root Locus of the system whose open loop transfer function is $G(S) = \frac{K}{S(S+1)(S+3)}$. Determine the value of K for damping ratio equal to 0.5. Analyze the stability condition of the system for the damping ratio 0.5. CO4- Ana (16)

Or

(b) The characteristic polynomial of a system is $s^7 + 9s^6 + 24s^5 + 24s^4 + 24s^3 + 24s^2 + 23s + 15 = 0$. Determine the location of roots on s-plane and hence the stability of the system. CO3- Ana (16)

15 (a) A system is represented by State equation $\dot{X} = AX+BU;$ $Y = CX$ where $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & -1 & 1 \\ 0 & -1 & -10 \end{bmatrix}; B = \begin{bmatrix} 0 \\ 0 \\ 10 \end{bmatrix}$ and $C = [\,1 \quad 0 \quad 0\,]$ CO3- Ana (16)

Inspect the Transfer function of the System and analyze the state variables of the system.

Or

(b) Obtain the state model of the electrical network shown in figure by choosing V1(t) and V2(t) of state variables; also analyze the stability of the system. CO2- App (16)