# B.Tech IV Semester End Examination, December 2021

## CONTROL SYSTEMS (19APC0407)

(Electronics & Communications Engineering)

**PART-A** **(10 × 2 = 20 M)**

**(Compulsory Question)**

**Answer the following.**

1 a) Give any two examples of closed loop system.

b) What is servo motor?

c) Define steady state error.

d) Write the Routh's absolute stability condition.

e) Define type and order of the system.

f) Define phase crossover frequency.

g) The open loop transfer function of a control system is given by G(S)H(S)=K/S(S+6)(S^2+4S+13). Then find out the angle of asymptotic lines with respect to negative real axis.

h) Define state and state variable.

i) What is Lead compensator?

j) Write properties of state transition matrix.

**PART-B** **(5 × 10 = 50 M)**

**(Answer all the questions from each unit; All questions carry EQUAL marks)**

**UNIT-1**

2 Compare between open loop and closed loop system **10 M**

**(OR)**

3 Convert the block diagram shown in Figure-1 to signal flow graph and find the transfer function of the system **10 M**

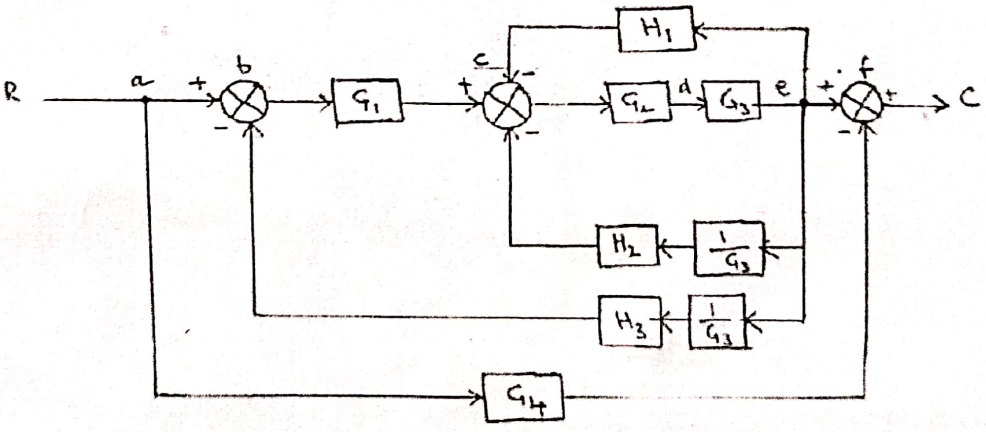


figure-1

**UNIT-II**

4 A unity feedback control system has an open loop transfer function G(s) = 16/S(S+2). Determine the natural frequency, damping factor, percentage overshoot and time at which the maximum overshoot occurs **10 M**

(P.T.O)

(OR)

5 Why derivative controller is not used in control systems? What is the effect of PI controller on the system performance? **10 M**

## UNIT-III

6 Explain the procedure to draw root locus of a given transfer function **10 M**

(OR)

7 Investigate the stability of the closed loop system for the following C.E using *R–H* stability criterion. $S^6 + S^5 + 6S^4 + 5S^3 + 10S^2 + 5S + 5 = 0$ **10 M**

## UNIT-IV

8 By of Nyquist criterion, determine whether the closed loop system having the following open loop transfer function is stable or not. If not, how many closed loop poles lie in the right half s-plane? **10 M**

$$G(s)H(s) = \frac{180}{(s+1)(s+2)(s+5)}$$

(OR)

9 Explain the general procedure for constructing Bode plots **10 M**

## UNIT-V

10 Derive the transfer function from the state-space representation **10 M**

(OR)

11 Check for the controllability for the following system **10 M**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -0.5 & 0 \\ 0 & -0.2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u(t), \; y = \begin{bmatrix} 1 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}.$$

*****