

H.T.No.

--	--	--	--	--	--	--	--	--	--

Code No: EC1524

GEC-R14

II B. Tech II Semester Regular Examinations, April 2017

CONTROL SYSTEMS

(Electronics and Communication Engineering)

Time: 3 Hours

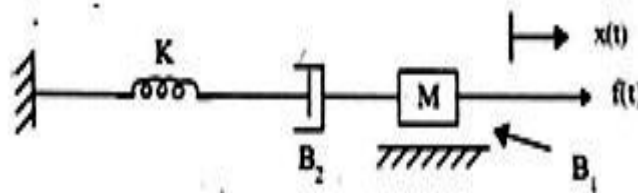
Max. Marks: 60

Note: All Questions from **PART-A** are to be answered at one place.Answer any **FOUR** questions from **PART-B**. All Questions carry equal Marks.**PART-A****6 × 2 = 12M**

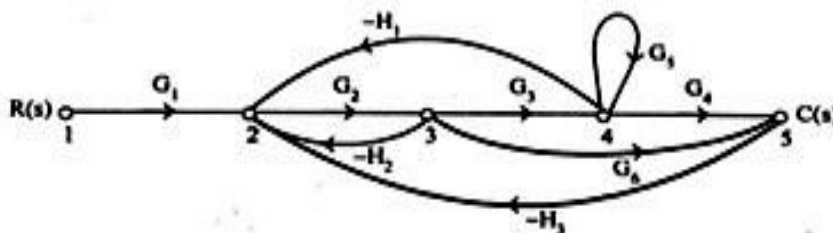
1. Define the transfer function in control system.
2. Define Peak time and percentage peak over shoot of a under damped system.
3. For $G(s)H(s) = \frac{K(s+1)(s+3)}{s(s+2)(s+6)}$. Determine (i) Asymptotes, (ii) Root locus on real axis.
4. Draw the polar plot for type 0 system.
5. Define State and State variable.
6. What is meant by Multiple –order sampling?

PART-B**4 × 12 = 48M**

1. a) Write the equations of motion in s-domain for the system shown in figure. Determine transfer function. (6M)



- b) Find the overall gain $C(s)/R(s)$ for the signal flow graph shown in figure. (6M)



2. a) Consider the closed-loop system given by $\frac{C(s)}{R(s)} = \frac{w_n^2}{s^2 + 2\zeta w_n s + w_n^2}$. Determine the values of ζ and w_n so that the system responds to a step input with approximately 5% overshoot and with a settling time of 2 sec. (Use the 2% criterion). (6M)
- b) Define position, velocity and acceleration error constants. Express steady state errors in terms of error for type-1 and type-2 systems. (6M)
3. A feedback control system has loop transfer function $G(s)H(s) = \frac{K}{s(s+2)(s+10)}$. Sketch the root locus and determine the range of K for which the system is stable. (12M)
4. a) Derive the transfer function of lag-lead compensator. (8M)
- b) What are the limitations of phase lead compensation? (4M)
5. Find the state response of the system

$$\dot{X}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} X(t) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$

For $X_0 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ and a unit step input. (12M)

6. Draw the block diagram of a digital control system and explain its various components. (12M)
