PVP 14

Code: EE4T5

II B.Tech - II Semester – Regular/Supplementary Examinations
April 2018

CONTROL SYSTEMS

(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11 x 2 = 22

1.

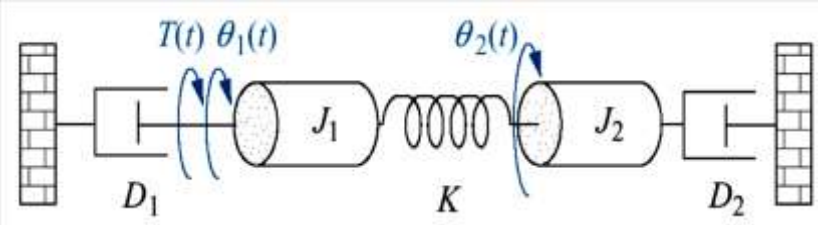
a) Define sensitivity. What is the effect of noise on overall transfer function?
b) Compare open loop and closed loop systems.
c) Define transfer function.
d) Write Mason's gain formulae.
e) Define delay time, Rise time, and maximum peak overshoot in time response of second order systems.
f) Define BIBO stability.
g) Define the terms Gain Margin and Phase margin.
h) Define the lead compensation? Write down the transfer function of a lead compensator.
i) Define state transition matrix.
j) Write the general state model of a linear time invariant system.
k) Write the equations for restoring forces of mass, spring and dashpot in mechanical translational system.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

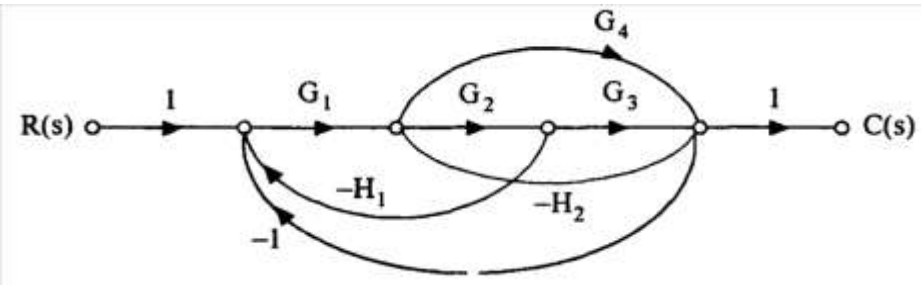
2.a) Obtain the transfer function $\theta_2(s)/T(s)$ for the following mechanical rotational systems. Consider Rotational Friction Coefficient as 'D' 8 M



b) Obtain transfer function of armature controlled DC servo motor. 8 M

3.a) A unity feedback control system with open loop transfer function, $G(s) = \frac{10}{s(s+2)}$. Find rise time, percentage peak overshoot, peak time, setting time for a step input. 8 M

b) Obtain the overall transfer functions for the following signal flow graphs using mason's gain formula. 8 M



4.a) Consider the characteristic equation

$$s^4+2s^3+(4+K)s^2+9s+25 = 0$$

Using the Routh-Hurwitz stability criterion, determine the range of K for stability. 8 M

b) List and explain various types of stability and necessary conditions for stability. 8 M

5.a) Draw Bode plot for the following transfer function.

$$G(s) = \frac{10}{s(1+0.4s)(1+0.1s)}$$ 8 M

b) Discuss the steps for design of phase lag-lead compensator in frequency domain. 8 M

6.a) Determine canonical state model of system, whose transfer function is $T(s) = \frac{2(s+5)}{[(s+2)(s+3)(s+4)]}$ 8 M

b) Determine state controllability of the system given by state equation. 8 M

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 10 \end{bmatrix} u$$