Karunya University
(Karunya Institute of Technology and Sciences)
(Declared as Deemed to be University under Sec.3 of the UGC Act, 1965)

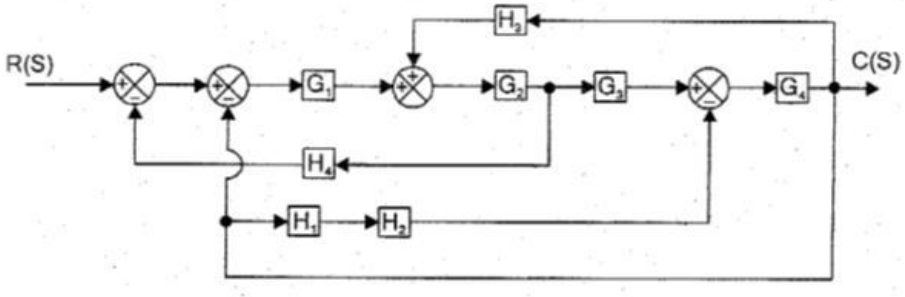
End Semester Examinations - 2015-16 Even Semester - May 2016

14EI2005 Control System

Set B

Time : 3 hrs
Total Marks: 100

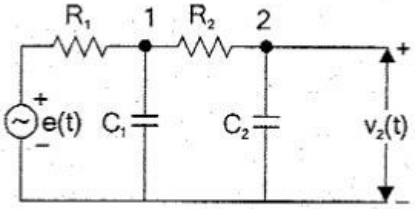
1. a. Find the transfer function of the block diagram using block diagram reduction techniques. (15)



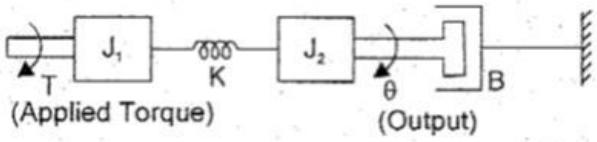
b. What is control system? Explain open loop and closed loop control system with an example. (5)

OR

2. a. Write the differential equation governing the electrical system and derive its transfer function. (15)



b. Write the differential equations governing the mechanical rotational system shown below. (5)



3. a. Obtain the response of second order undamped system when it is subjected to unit step input. (15)
b. Obtain the response of unity feedback system whose open loop transfer function is $G(s) = \frac{4}{s(s+5)}$ for a Unit step input. (5)

OR

4. a. A Unity feedback control system has an open loop transfer function $G(s) = \frac{10}{s(s+2)}$ find the rise time, Percentage overshoot, peak time and settling time for a step input. (15)
b. The closed loop transfer function of a second order system is given by $\frac{C(s)}{R(s)} = \frac{200}{s^2+20s+200}$. Determine the Damping ratio and natural frequency of oscillation. (5)

5. a. Construct Routh array and determine the stability of the system represented by the characteristic equation $s^5 + s^4 + 2s^3 + 2s^2 + 3s + 5 = 0$. Comment on the location of the roots of characteristic equation. (15)

b. What is the necessary condition for stability? Explain the relation between stability and coefficient of characteristic Polynomial. (5)

OR

6. Sketch the root locus of the system whose open loop transfer function is, $G(s) = \frac{k}{s(s+2)(s+4)}$. Find the value of K so that the damping ratio of the closed loop system is 0.5. (20)

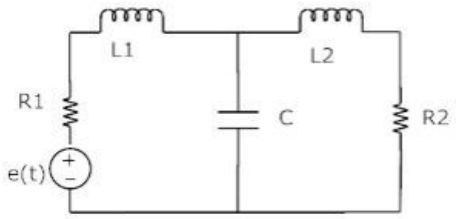
7. Sketch Bode plot for the following transfer function and obtain the gain and phase cross over frequencies $G(s) = \frac{20}{s(1+3s)(1+4s)}$. (20)

OR

8. a. The open loop transfer function of a unity feedback control system is given by $G(s) = \frac{1}{s(1+s)^2}$. Sketch the polar plot and determine the phase margin and gain margin. (15)

b. Define gain and phase cross-over frequency. Write the expression for resonant peak. (5)

9. a. By choosing minimal number of state variables obtain the state model of the electrical network shown below. (15)



b. Narrate the features of P controller and PID controller. (5)

Wishing you All the Best
