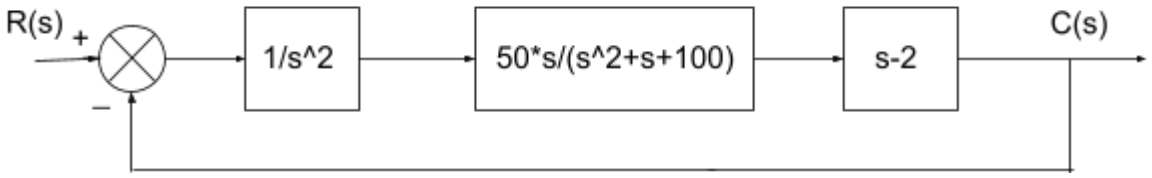
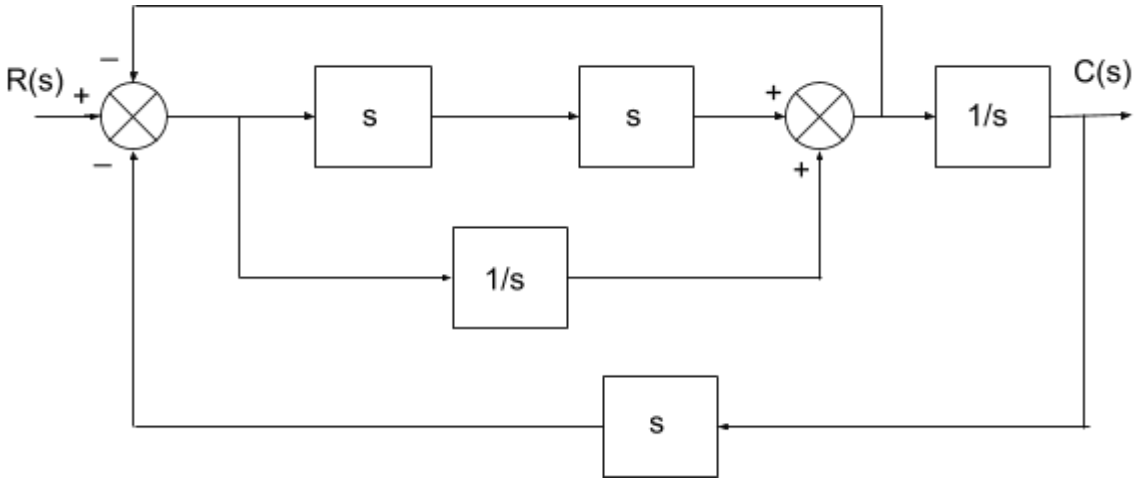
EE324, Control Systems Lab, Problem sheet 4
(Report submission date: 7th February 2021)

Q1: Writing Scilab codes to obtain input-output transfer functions for complex interconnected systems.

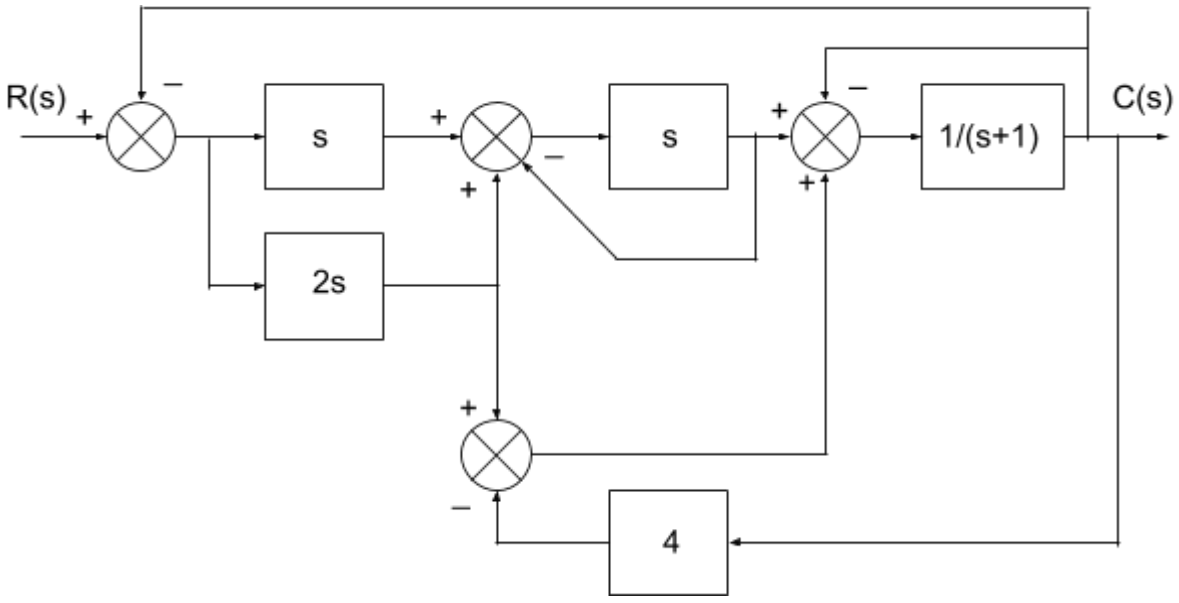
a)



b)



c)



Q2: Let *G(s)=10/s(s+2)(s+4)* be the transfer function of a plant. Suppose a proportionality gain *K* has been put in the forward path in series with the plant and then the feedback loop has been closed with unity negative feedback.

(a) Write a Scilab code that finds the closed-loop transfer function for a given value of *K*.
(b) Plot the loci of the closed-loop poles as *K* varies from 0 to 100 in steps of 0.1.
(c) From your plot, estimate the critical value of *K* that takes the closed-loop system to the verge of instability.
(d) Verify your estimation from Part (c) above with R-H table.

Q3: Form the R-H table for the following polynomials. Use command routh_t

a) s^5 + 3*s^4 + 5*s^3 + 4*s^2 + s + 3
b) s^5 + 6*s^3 + 5*s^2 + 8*s + 20
c) s^5 - 2*s^4 + 3*s^3- 6*s^2 + 2*s - 4
d) s^6 + s^5 - 6*s^4 + s^2 + s - 6

Q4:

(a) Construct a degree 6 polynomial whose R-H table has its entire row corresponding to s^3 to be zero.
(b) Repeat Part (a) with a polynomial of degree 8 and having the entire row corresponding to s^3 to be zero.
(c) Construct a degree 6 polynomial whose R-H table has the first entry in its row corresponding to s^3 to be zero.