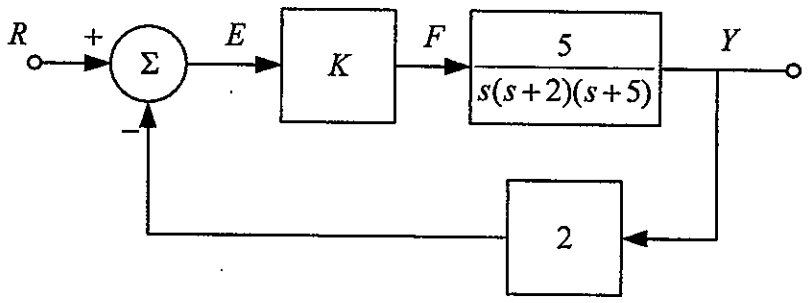
# 國立臺灣大學 113 學年度碩士班招生考試試題

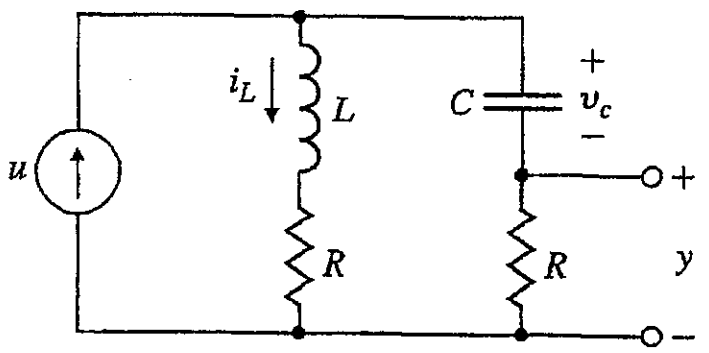


Problem I (40%). For the system shown below, sketch the Nyquist plot and apply the Nyquist criterion to

(a) (20%) Determine the range of values of $K$ (both positive and negative) for which the system will be stable, and
(b) (20%) Determine the number of roots in the right-half-plane for those values of $K$ for which the system is unstable. Check your answer using a rough root-locus sketch.




Problem II (60%). Consider the electric circuit shown below




(a) (20%) Derive the internal state equations for the circuit. The input $u$ is a current, and the output $y$ is a voltage. Let $x_1 = i_L$ and $x_2 = v_c$.
(b) (20%) What condition(s) on $R$, $L$, and $C$ will guarantee that the system is controllable?
(c) (20%) Find the system transfer function using matrix algebra.

試題隨卷繳回