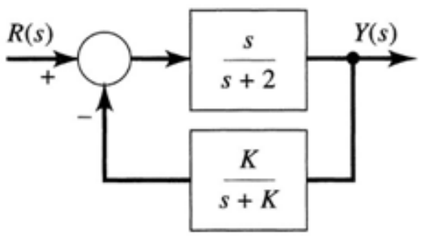
國立嘉義大學 99 學年度

生物機電工程學系碩士班（乙組）招生考試試題

科目：自動控制　　（※禁止使用計算機）

1. A vehicle of mass 1000 kg is modeled as mass of this size supported on a spring-damper as shown in the below figure. The spring stiffness is 40 kN/m and the damping factor of the damper is 80 kN·s/m. Express the frequency response of the system in terms of the output, displacement x and the force P, when the surface variation y is the input. What are the amplitude and phase angles of these quantities when y has an amplitude of 0.05 m at an angular frequency of 100 rad/s?(25 分)

2. For a control system with an adjustable parameter K as shown in the following figure,



(a) Obtain the overall transfer function. (5 分)
(b) Draw the root locus. (15 分)
(c) Determine the system stability. (5 分)

3. For a system with a stable transfer function given bellow,

$$T(s) = \frac{10}{s^2 + 3s + 10}$$

(a) Find the error to a unit ramp input. (15 分)
(b) Find the system response to a unit step input by mean of partial fraction expansion. (10 分)

4. Consider the system shown in the below figure. What are the values of gain K which will achieves the following design specifications?
(a) $e_{ss} \le 0.1$ for a unit step input in R(s). (12 分)
(b) $e_{ss} \le 0.2$ for a step change of 2 in the disturbance D(s). (13 分)