國立臺北科技大學九十六學年度碩士班招生考試

系所組別：1320 車輛工程系碩士班乙組

第一節 自動控制 試題

注意事項：

1. 本試題共 4 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. (25%) Some methods or methodologies are necessary and useful in the analysis or designing of control systems. Concisely describe the functions and necessities for the following methods.

(a) Laplace Transform; (5%)
(b) Routh-Hurwitz Criterion; (5%)
(c) Bode plot; (5%)
(d) Nyquist Diagram; (5%)
(e) Lead Compensation. (5%)

2. (25%) The time response of a given system corresponding to a step input (amplitude =2) is shown in Fig. 1.

(a) Find the transfer function of this system approximately; (10%)
(b) According to the system you found in (a), calculate the approximate locations of poles for the system; (5%)
(c) If the poles you calculated are horizontally shifted to left 2 units, what changes can be observed in the overshoot, rise time and damped frequency for that system? Describe the changes and mention your reasons. (10%)

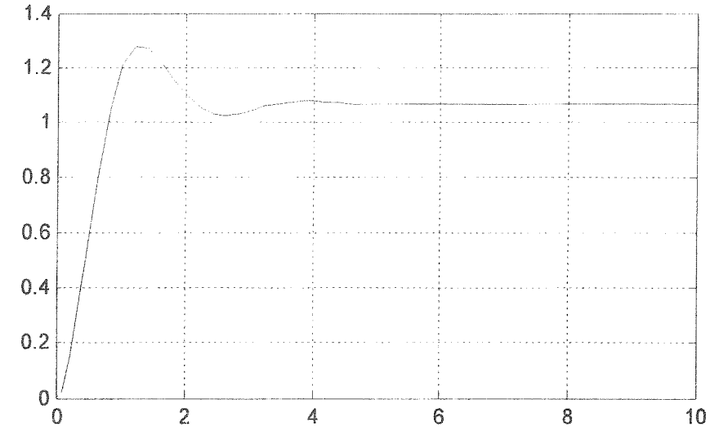

Fig.1

3. (25%) A suspension was modeled as Fig. 2.

(a) Find the differential equation and transfer function for this system (m is mass, K is spring constant, C is damping ratio, *f* is an applied external excitation, and y is displacement of the mass) (5%)
(b) If the applied excitation *f* is a unit-step function, and the system was initially pushed downward 0.1 unit before the force was applied. Find the output Y(s) for this system (use the values as m = 1, C=1, and K=3). (5%)
(c) If Fig. 3 is one time response of this suspension system corresponding to the same external excitation *f*. Plot the time response for the case in (b) roughly. (5%)
(d) Proof that this system has infinite steady-state error corresponding to a ramp input. (10%)

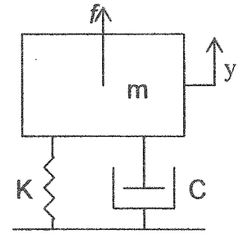

Fig. 2

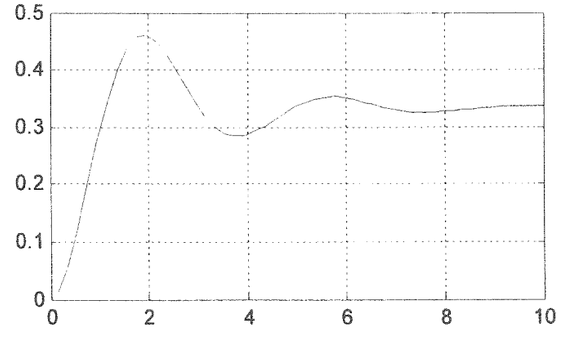

Fig. 3

注意：背面尚有試題

4. (25%) The block diagram of a system is as Fig.4.

(a) Roughly draw the root locus for the system. (5%)

(b) Find the asymptotes for the system. (5%)

(c) Find the corresponding breakaway points and break-in points. (5%)

(d) If a proportional gain K is added before the system, find the approximate value of K to make the system having settling time equal to 4 seconds. (10%)

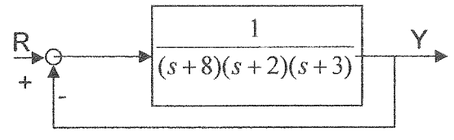

Fig. 4